Industrial Design USA: Human Systems

Prototype plastic man courtesy Henry Dreyfuss Associates

Design Quarterly 88

Design Quarterly 88

Published by Walker Art Center
Vineland Place
Minneapolis, Minnesota

Editor: Mildred S. Friedman
Graphic Design: James E. Johnson
Circulation and typesetting: Pamela Barclay
Graphic Design Assistance: Wayne Henrikson

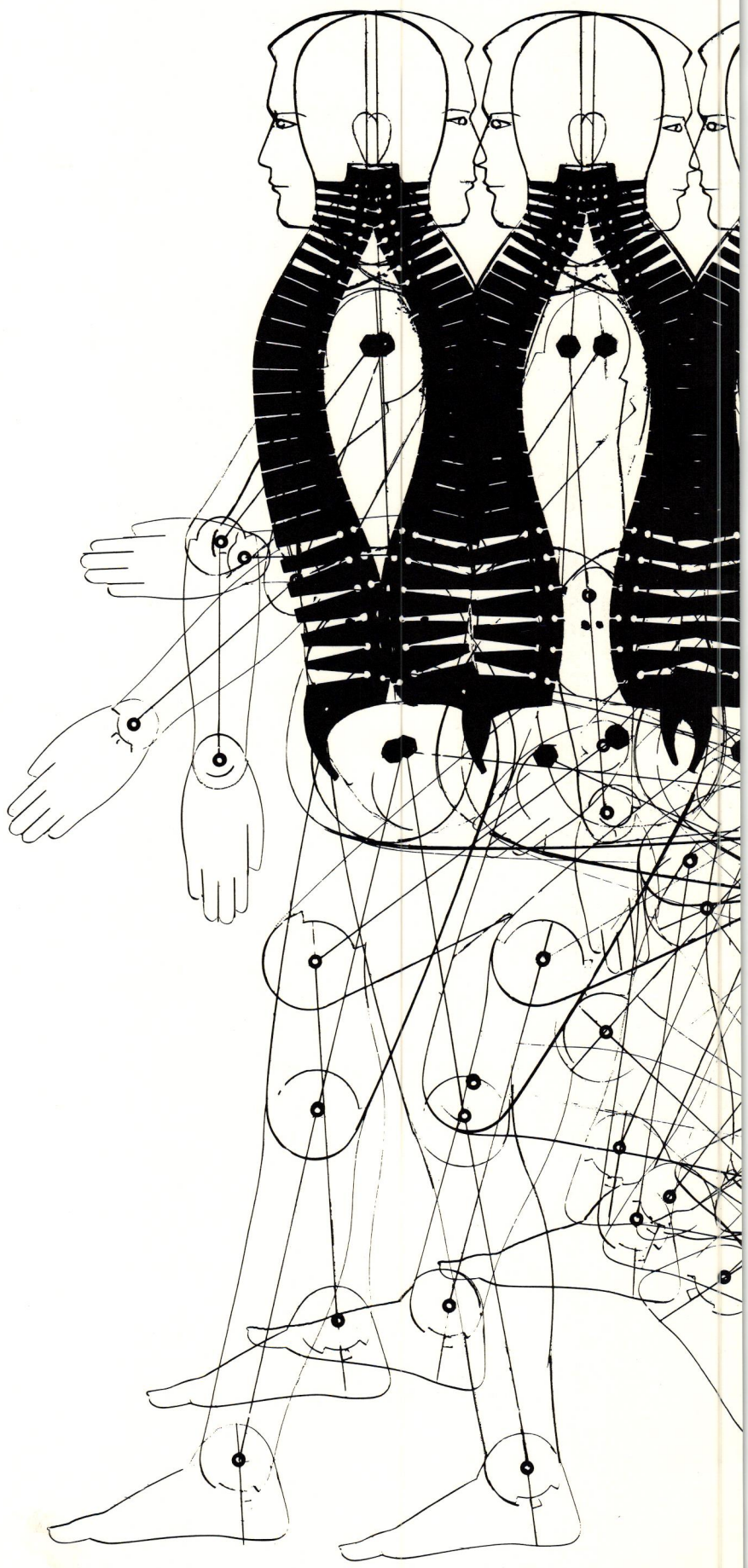
Design Quarterly is listed in Art Index

Change of address: To insure receiving all
copies, give old address as well as the new one
and allow five weeks for change to become effective.

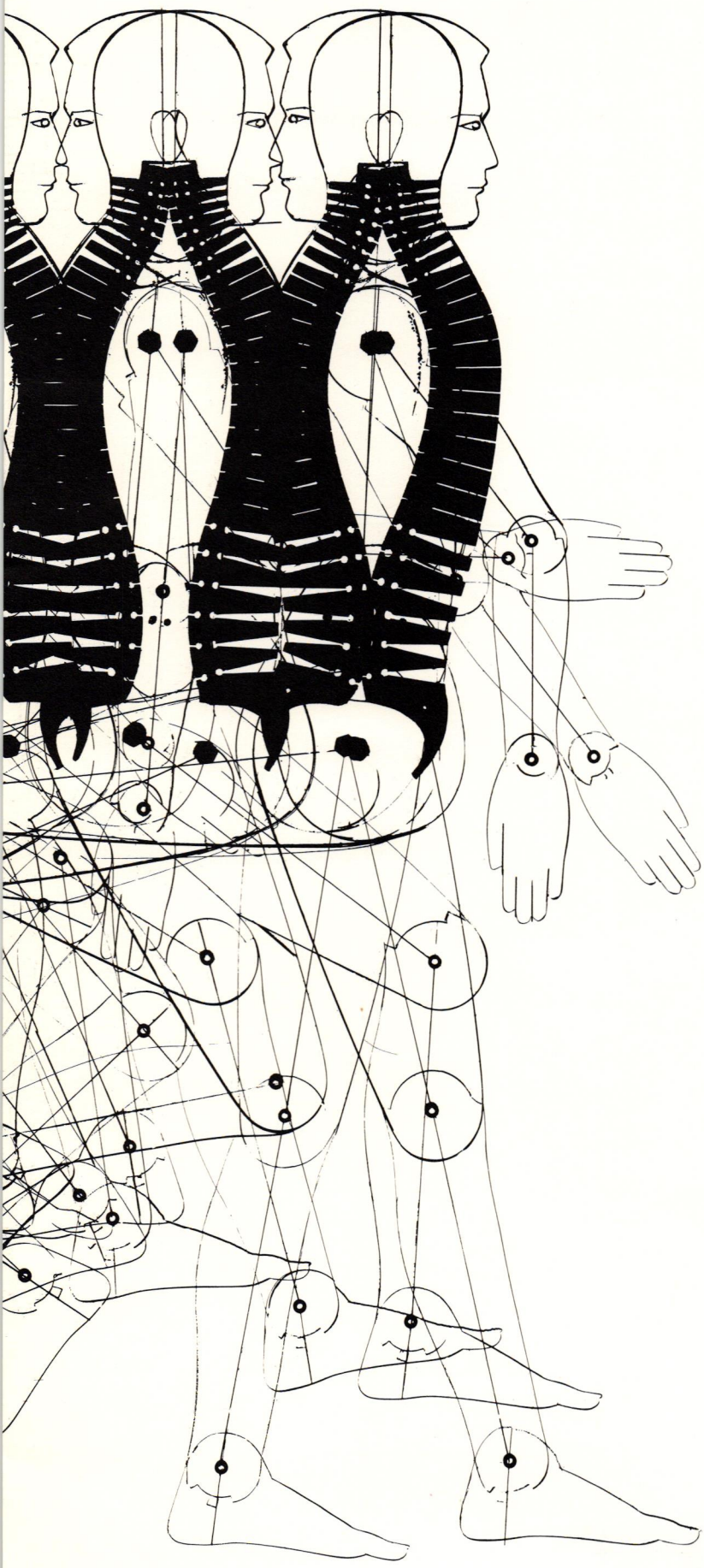
Subscription rates:
4 issues $5, 8 issues $9.25, 12 issues $12.50
Single issues $1.60
Double issues $3.00
(Double issue constitutes 2 issues)

Foreign postage: $1.00 for 4 issues

This issue of **Design Quarterly** is supported
in part by a grant from the National Endowment
for the Arts, Washington, D. C.



Industrial Design USA: Human Systems



Patricia Conway

Contents

All photographs and drawings are courtesy the designers except those on pp 7, 11, 12 which are courtesy the Museum of Modern Art.

Editor's Notes and Acknowledgments

It has been some time since *Design Quarterly* has published material on industrial design. "Good Design" has long been an accepted goal of the profession and is no longer an issue for debate; at least among serious practitioners and their clients, it is a given. It is also accepted that good design, in the old award-winning sense of the term, is the icing on a cake so rich it has become difficult to digest.

Over the last half-dozen years, the "leading edge" of the industrial design profession has moved into an area that deals essentially with questions of resource management and only secondarily with product design: conservation of dwindling and non-replenishable raw materials, recycling, extension of product life, reduction and control of environmental pollution, and real as opposed to market-manipulated user needs. Most of these questions have been widely discussed from the environmentalists' and consumer advocates' points of view. How the design professions are responding to them is the focus of *Design Quarterly 88.*

In addition to thanking those designers whose work and comments appear in this issue, *Design Quarterly* would like to acknowledge the contributions of:

F. Eugene Smith (F. Eugene Smith Associates), Dick Latham (Richard Latham Associates), Larry Goldfarb (Brown, Goldfarb, Gallagher), Harold Lewis Malt (Harold Lewis Malt Associates), Arthur Pulos (Chairman of the Design Department, Syracuse University), James Alexander (Professor of Industrial Design, University of Cincinnati), Robert Alexander (Professor of Design, Michigan State University), Bob Malone (Dean of Art and Design, Pratt Institute), Aarre K. Lahti (Professor of Design, University of Michigan), William Lansing Plumb (William Lansing Plumb & Associates), Walter Dorwin Teague Associates, Dave Chapman (D.C. Design), Harry Bartley Archinal, Anita Margill and T. Chipley for their thoughtful responses to the DQ questionnaires and interviews;

Victor Papanek for the many valuable insights contained in his book, *Design for the Real World* (Pantheon, 1971);

Roger Guilfoyle, Editor of *Industrial Design,* and Ann Ferebee, Editor of *Design and Environment,* for their general guidance;

Walter McQuade, Editor of *Fortune,* for the retrospective view and first paragraph quote provided by that magazine's analysis, "Decline of Industrial Designers," published February 1963;

Percival Goodman, Professor of Architecture at Columbia University and the author (with Paul Goodman) of *Communitas,* for his introduction to this issue; and

Patricia Conway, free-lance writer, photographer and planning consultant, who wrote this analysis of industrial design after many hours of conversation with designers around the country. Formerly an Associate Editor of *Industrial Design* magazine, she has written articles on design, transportation, resource management and urban affairs for *Design and Environment, Nation's Cities,* "Potomac" (the Sunday supplement of *The Washington Post*) and is the author of *Design Quarterly 71,* "Mass Transit: Problem and Promise."

MSF

Introduction

Percival Goodman, F.A.I.A.

It is not architects who are responsible for the look of our cities, our suburbs, our offices and our homes. It is industrial designers. Not because industrial designers have a more urgent message than architects, but because of their role as form givers in mass production. Unlike their antecedents—the anonymous draftsmen and boiler plate makers who put curlicues on the first sewing machines and decorated the interiors of Pullman cars—the early industrial designers were highly sophisticated technicians who had not only learned the lesson of Paxton's Crystal Palace (new materials plus new methods equal new forms), but who appreciated the insights of market research and the value of visual slogans. From these men came the wide ranging choices—the sensitive and the elegant designs as well as the perversions possible only in an economy producing more than is strictly necessary even for the rich—that formed the taste of the American people and created the American scene.

Architects have been encumbered by traditions: banks, mortgages, zoning laws, building codes, craft unions and God knows what other machinery that is slow to change. Indeed, it took more than a hundred years to go from the prototype glass-and-steel Crystal Palace to the modern glass-and-steel Seagram building. But industrial designers' clients have always asked for novelty, variety, change. The objects they manufacture are intended to catch the eye for a season and then go out of fashion. Under such conditions, industrial designers can be whimsical, even experimental, and their innovations find quick popular acceptance. Making their way from department stores, supermarkets, gift shops and automobile showrooms directly into homes, offices and parking lots, the creations of industrial designers become the instant American esthetic. Only because the most conservative bankers and government officials are constantly being educated by the omnipresent creations of industrial designers do architectural innovations, like glass curtain walls, eventually become acceptable mortgage risks.

So who is to blame for the fact that New York's World Trade Center flushes 7000 toilets directly into the Hudson River? That Los Angeles County has been told it may have to cut automobile traffic 80 percent by 1975 in order to meet government environmental standards? The architects? The industrial designers? I suppose so, but then, are we not all partners in the rape of our environment?

It is generally agreed that if this planet is to remain habitable, the technology and economies of developed countries must be drastically reoriented. The only question is how soon we will have to start considering the effect of what we design on the biosphere. To my mind, the approach we must take is suggested by San Francisco's Environmental Impact Law which asks: "Will the proposed building adversely affect the environment?" "Are there adequate sewers, water, energy, transportation, to service the building?" To these questions I would add: "Do people really need the building?" "If a building is needed, are more desirable alternative sites or designs available?" I hope that citizens themselves will start asking these questions, not only of architects and their clients, but of industrial designers and theirs.

Industrial Design USA: Human Systems

Patricia Conway

For a profession only 50 years old, modern industrial design has had a remarkably turbulent career and has generated more than its share of controversy. From its Bauhaus beginnings in the 1920s until today, when its practitioners in the United States alone are conservatively estimated at some 10,000, industrial design has been the subject of endless theoretical debate and, more recently, severe practical criticism. It's been declared dead or dying a number of times (a pronouncement which, if correct, would make it what one observer has described as the "shortest-lived free-standing profession on record") and survived to prove its obituaries premature. It is regarded by some as a positive force capable of reshaping and enhancing nearly every aspect of our lives, and by others as an almost criminal exercise in greed, negligence and willful destruction of the environment. The problems it raises subsume everything from economics and technology to morals, ethics, philosophy, esthetics and politics. Among its current practitioners are a few very aware, very articulate individuals who really care about these problems (but who can't, or don't, always do anything about them) and many more who regard their calling as just another way to make a buck.

The purpose of this *Design Quarterly* is to examine how the industrial design profession in the United States is responding to some of the more crucial problems facing it today, and to try to determine the direction in which the "leading edge" of the profession is headed. But in order to put contemporary American industrial design in its proper perspective, it is important to recall the profession's not-so-distant origins.

Unlike the Bauhaus movement in Europe, industrial design in this country was from its inception a commercial rather than an academic or philosophical exercise. Born during the Great Depression, industrial design in the United States enjoyed immediate success as a stimulant to the then sluggish mass market. Its function was two-fold: to innovate new products or improve the basic operating characteristics of existing ones; and to give products greater market appeal through "styling." At the same time, the position of design in the corporate hierarchy became firmly established: somewhere above the typing pool but subordinate to marketing and sales management. Whether or not prophetic of the direction the profession was later to take, many pioneers like Norman Bel Geddes and Henry Dreyfuss had begun their careers not as painters, craftsmen, engineers, inventors or academicians—but as stage and window display designers. Thus the historic marriage of art and industry at Weimar in 1919 was celebrated here during the 30s as a union of artifice and salesmanship.

After a brief eclipse during World War II (production was temporarily shifted from consumer to military goods), industrial design re-emerged, but the circumstances surrounding its early success were dramatically reversed. No longer challenged to revive a sagging economy, the profession was able to ride the post-war boom of the late 40s and early 50s by simply responding to the pent-up demands of a public starved for consumer goods. As these demands escalated to the giddy heights of all-out consumerism, industrial designers eagerly lent their talents to one of the most critical phenomena in modern economic history: accelerated obsolescence. Heretofore

"durable" goods were now being promoted, consumed and discarded according to the same vagaries that dictate hemlines, and "annual style changes" invaded every market from toasters to tractors. At the same time, rapid advances in the technology of disposability—while greatly beneficial in those relatively few applications where sterility is desirable (diapers, thermometers, hypodermic needles, etc.)—transformed even "heirloom" items like watches and dishes into "expendable" goods.

As product life declined, the role of industrial design was diminished to "packaging"—to manipulating buyers' impulses rather than meeting users' needs. Tailfins one year, an extra strip of chrome the next. And if that didn't sell, a couple of decals to brighten up a housing beneath which the guts of that year's "new, improved" model remained essentially unchanged. The art of product styling degenerated from a form-giving discipline (as it had been understood in the 20s and 30s) to an exercise in motivational psychology. In an effort to furnish split-level suburbia with the illusions of Versailles, the Spanish countryside or space-age modernity, designers tortured TV sets to look like small versions of the Parthenon, refrigerators to look like barn doors and kitchen appliances to suggest the control panel of a rocket ship.

Not surprisingly, these excrescences eventually drew fire both from within the profession itself and from those self-styled arbiters of taste, the design critics. Rattling the bones of the Bauhaus and solemnly invoking Greenough's hallowed adage that "form follows function," the design journals of the 60s embroiled themselves in debates on questions like "why a telephone should not look like a banana"—while a telephone that does, in fact, look a bit like a banana (Bell's Trimline model) was being enshrined in the permanent collection of one of the country's leading art museums. The thrust of such debates was essentially esthetic: honest use of materials (plastic that looks like plastic vs. plastic that looks like wood grain); uncluttered lines (clean housings vs. complicated shapes and tacked-on-trim); forthright expression of function (household appliances that look like what they are vs. consoles disguised as Hungarian Provincial commodes). Almost lost in the clamor were a small but growing number of designers who felt that "truth" just might be more important than beauty, and that "truth" in industrial design was largely a function of human factors engineering—the science of maximizing safe, efficient, and comfortable interaction between user and product by designing for measurable human tolerances (arm length, weight displacement, etc.).

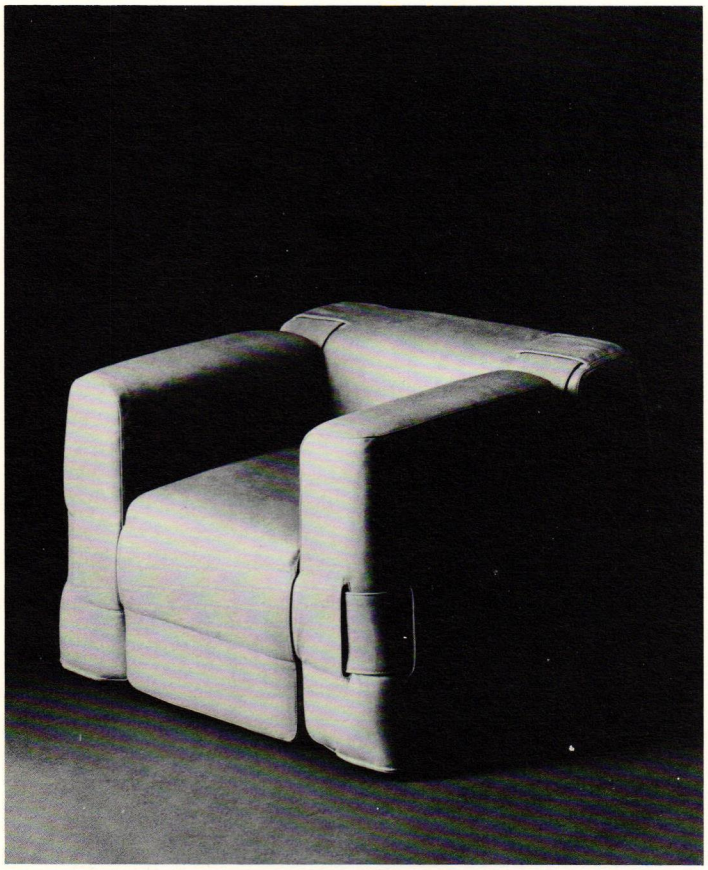
For the most part, however, American designers during the early and mid-60s were too busy feeding the seemingly insatiable appetites and indiscriminate palates of American consumers to heed either the estheticians or the human factors engineers. Those who were interested in practicing "good design" (as defined by critics of the day) had to look for clients among manufacturers of business machinery, scientific and medical equipment, or high-technology hardware. There, in the rarified atmosphere of capital investment, long-term amortization, and government-subsidized research and development, the basic principles of rational design became economically respectable. After all, a computer, unlike a car, is not traded in every two years—not yet.

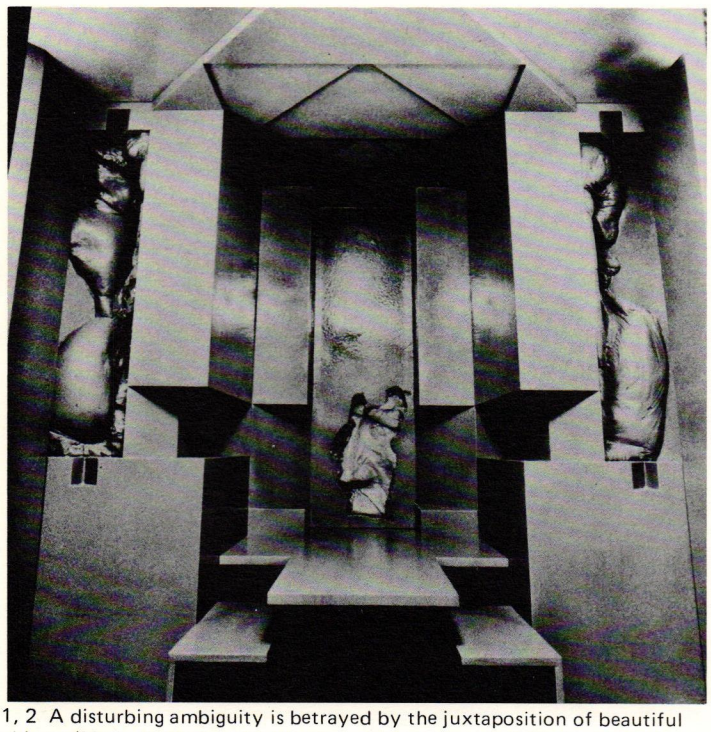
As for that socially conspicuous minority of consumers who sought the same level of "good modern design" for their homes as they might have encountered in their corporate headquarters—such sophisticates had to look abroad and pay through the nose. Tableware from Finland, appliances from Germany, lighting from Denmark, furniture from Italy—most of it attractively designed, much of it horrendously expensive (one couch can cost as much as an average middle class family spends to furnish an entire room), and some of it ridiculously non-functional (chairs so low only a four-year-old can seat himself without losing his dignity or slipping a disc). Frequently voiced during the esthetic debates of the 60s was the hope that all this "good design" from abroad would somehow "educate" the American masses—that domestic manufacturers would either have to foresake the supermarket for the atelier or risk being wiped out by foreign producers who, following the lead of their countrymen in the automotive industry, would move in with competitively priced products so much more appealing that the average American consumer could not resist them.

To a very limited extent this has happened. The Japanese have virtually taken over the home electronics market with product lines that not only perform as well or better than anything made here (and sometimes cost a little less), but also feature at least one fairly well designed "contemporary" model that puts to shame the schlocky styling still being pandered by retreating American manufacturers. But while the tailfin may have given way to the less egregious (though even more impractical) fastback, the market for "good design" in this country remains limited to decorative, "accessorizing" boutique items. With a few exceptions neither consumers nor manufacturers in America have shown much inclination to "refine" their tastes and foreign manufacturers are not tooling up to do the job for them. By the time a classic design does make an impact on the mass market, some high-volume manufacturer has knocked it off in a form so grotesquely altered as to be unrecognizable.

At this moment, it is a stultifying elitism, more than a recalcitrant mass market, that poses the most serious threat to "good design." *New York Times* critic Ada Louise Huxtable has summed up the situation in her comments on a recent showing of Italian home furnishings (*Italy: The New Domestic Landscape)* at the Museum of Modern Art: "Italian design is full of those seductively false and beautiful images of the myths of industrialized society. 'Progress' is 'styled;' visual effects [are] often unrelated to the facts of production and increasingly, even romantically, dissociated from reality."

But whether or not its esthetic principles are valid, it is not the "good design" movement that has exposed American designers' most serious failings. For this, the profession has "outsiders" like Ralph Nader to thank. Until the appearance of *Unsafe at Any Speed* in 1965 it never occurred to anyone—the public, the design critics or, least of all, designers themselves—that tailfins might not only be ugly, but dangerous as well. By shifting the emphasis from what a product looks like to how it performs—whether or not it is safe for the user, how long it will last, how easily it can be repaired—Nader caught industrial designers with their pants





1, 2 A disturbing ambiguity is betrayed by the juxtaposition of beautiful objects (Mario Bellini's belted leather chair, top) and nihilistic protest (Gaetano Pesce's dehumanized environment of a speculative future, bottom) in *Italy: The New Domestic Landscape*, at the Museum of Modern Art.

down—an indignity from which, in large measure, they have not yet recovered. Perhaps designers do not deserve all the blame for the 60,000 American highway deaths last year, but total oblivion to their responsibilities until Nader pointed them out, coupled with a strange complacency in the face of subsequent revelations, has earned the profession a villainous name among some people who, prior to 1965, had never even heard of industrial design. Nor are automotive designers, who account for nearly one fourth of the profession, the only culprits. Following in the footsteps of Nader, a new and vociferous breed of crusaders—the consumer advocates—has uncovered the same kind of design negligence in home appliances and children's toys. The result, deserved or not, is guilt by association. Guilt by association with manufacturers who not only market dangerous products, but who fix prices, wield unseemly influence with regulatory commissions, and sabotage Congressional hearings. Guilt by association with manufacturers who, worst of all, refuse to mend their ways.

Certainly there are many designers to whose honest efforts such harsh judgment is not applicable. Unfortunately, however, exposure of the profession's very real weaknesses has come at a moment when informed public opinion is beginning to doubt the fundamental validity of product-as-life-style. In short, it is no longer simply a question of "is it beautiful" or " is it safe," but "do we need it at all?" Just about the time that Ralph Nader was indicting automotive designers for mass murder, popular social commentators like Vance Packard were alerting the public to the idiocies of "planned obsolescence" and the proliferation of marginally useful goods such as electric hair brushes. Here, too, the profession's culpability is abundantly clear, but its response to the charges has ranged from indignation to indifference. After all, for many designers whose entire practices are geared to appearance styling, "planned obsolescence" is the name of the game. Besides, marginal utility never actually killed anyone, did it?

Then came those harbingers of doom, environmentalists, who have had the temerity to suggest that even if a product is necessary in the first place, and even if it is beautifully designed and safe to use, once discarded on the local dump it becomes a nuisance and an eyesore. Worse yet, the combination of unrefined manufacturing techniques, primitive disposal methods, and steadily increasing consumption of goods and energy per capita is fouling our waters, poisoning our air, and threatening to bury us under a mound of refuse. Not to mention the fact that, in its eagerness to put two color TVs in every home (and from hence, every few years, onto the dump), our economic system is rapidly depleting the world's non-replenishable resources. And what do industrial designers who specify these non-replenishable resources for conversion into basically useless consumer products and eventually into solid waste have to say about all this? Not much. Like other mortals, most designers cannot imagine that the apocolypse could come to pass in their lifetimes.

Enter the bleeding hearts who say the hell with whether it's necessary, safe, or beautiful, whether it pollutes the environment or depletes non-replenishable resources—there are too many people who haven't got it. Either

because they can't afford it or because it's never been designed to meet their special requirements. What this world really needs are more, not less, consumer goods. Like simple, inexpensive refrigerators in which starving Indonesians can preserve their scarce and perishable food supplies; appliances, furnishings, and vehicles that old and handicapped people can use with ease. What are industrial designers doing to meet these needs? Precious little. There aren't too many clients around who think the market is worth exploiting.

Finally, there is the growing tendency, especially among the young, to question whether salvation really does lie in a second home, a third car, an inboard motor boat, a fourth color TV—or even a better mousetrap. These latter-day ascetics are embracing anti-materialism not only as a reaction against pollution and waste, but out of genuine concern for the spiritual limitations of a value system defined solely by the pursuit and consumption of not-so-durable goods. Admittedly, the number of people who harbor such sentiments—and are prepared to live by them—is small. But in a climate of widespread unhappiness among those people fortunate enough to enjoy everything our consumer-oriented society has to offer, such far-fetched notions could prove seductive. What are the implications for product designers of an "anti-product" movement?

Ironically, should such a movement ever gain sufficient momentum to make a dent in our economy, it would be designers themselves who could take at least partial credit for their own extinction. Not so much because of their failures, but because of their tremendous success. By lending their talents to the endless invention and promotion of consumer goods that are ever more accessible, ever shorter lived, and ever more disposable, designers are bringing about the ultimate devaluation of such goods. Class gives way to mass, and the end-state of Kleenex culture is value-free materialism; to wit, if everybody's got it, nobody can be made to feel important by possessing it. What remains is not a discrete product to be cherished, but rather a service to be consumed through the intermediation of an endless series of essentially non-differentiated and worthless products.

Take the case of the radio, the service is entertainment, information, or distraction. Assuming that this same service could be provided to the consumer through the intermediation of some other product—or possibly without the intermediation of any product—the radio, already stripped of its subjective value, would become objectively useless. In fact, the advent of television threatened just that, but then radio programers discovered that a large percentage of the population could become addicted to constant background noise without the sometimes impractical interference of a visual image. Unfortunately, the Muzak people discovered the same thing, and as the number of places in which one can escape wrap-around sound dwindles, so does the necessity for individuals to possess their own radios. It is not difficult to imagine the day when (God help us!) music and news will be piped out of every surface of this earth. On the other hand, as leisure time has increased, so has the desire for active, participatory (as opposed to passive, consumptive) recreation. Is it possible that a significant number of people will one day provide their own entertainment without benefit of radios or Muzak? Or are those individuals who prefer conversation and choral singing to a hyperventilating disc jockey merely a romantic aberration of the norm?

To take a less speculative example, there is the automobile—the paragon of all American status symbols. Does the fact that 18 percent of the American market now rejects Detroit's annual exercises in subliminal sex and aggression for the comparatively sedate functionalism of foreign compacts indicate a shifting perception from the automobile-as-possession to the automobile-as-service? To what extent has this shift in perception been catalyzed by the accelerating obsolescence of the automobile itself? Does accelerating obsolescence ultimately erode the subjective value of possession to the point where it is finally possible for the consumer to "see through" a product's connotative meanings to the basic service it performs? Significantly, this shift in perception of the automobile is occurring primarily among middle and upper-middle class consumers already sated on Detroit's manipulative fantasies, while the poor and the near-poor, and the recently poor remain highly susceptible to the lure of product-as-possession.

What these sociological factors suggest is some sort of natural curve in the progress of consumerism. Initially there is consumption of goods to satisfy more-or-less real needs (product-as-object) followed rapidly, as affluence increases or the expectation of affluence rises, by consumption for the sake of possession rather than utility (product-as-subject). As obsolescence accelerates, products become serially interchangeable and lose much of both their subjective and objective identity as discrete possessions; the result is consumption for its own sake (product-as-pursuit). Finally, with both subjective and objective values removed, there is a return to concern for basic utility (product-as-service or, in its more extreme manifestations, anti-product).

The logical implication of such a curve is a movement away from discrete, individually owned products toward shared access service systems: from individually owned radios to space-saturating sound systems; from the private automobile as a means of intra-urban transport to fast, efficient, non-polluting mass transit systems; from the clutter of poorly related kitchen appliances to integrated domestic food handling systems. For the industrial designer, this transition from discrete product to service system may spell the doom of traditional product design. But at the same time it opens the door to a whole new range of possibilities in systems design—a direction in which a number of practitioners are already moving.

Nor is industrial design the only profession in which systems concepts are gaining ascendancy. Architecture, urban planning, and interior space design are also under increasing pressure to forsake conventional piece-meal solutions and apply themselves to unified, comprehensive design efforts. And since these other design professions are also guilty, in one way or another, of all the failings that have tarnished the industrial designer's image, many heretofore separate-but-related design practitioners now find themselves in the same uncomfortably small boat. Consequently there is a gradual blurring of those boundaries which have traditionally separated the

various design disciplines, as well as a growing tendency within all design professions to call on non-design disciplines to help solve their problems (otherwise known as the interdisciplinary movement).

Unquestionably this sort of cross-pollination is both healthy and necessary. First of all, it recognizes the essential relationships among various design disciplines too long obscured. Secondly, any serious effort at systems design requires a broader perspective than the average design-trained professional, working alone, can provide. But, in and of itself, the interdisciplinary movement is not proving to be the panacea some designers are looking for. Unfortunately, the boundaries between various design disciplines are sometimes crossed more because of a practitioner's sense of frustration and defeat in his original field than because of aptitude for, or commitment to, a new undertaking. In some cases, it's a matter of sheer opportunism: more money to be made by offering clients a broader range of services. The result is not always urban planning enriched by architectural insights but, too often, watered-down urban planning.

Similarly, there are serious limitations to a non-designer's ability to solve a designer's problem for him. Most sociologists are trained to advance the principles of their own discipline, not to tackle isolated problems in, say, the design of a washing machine. Consequently there is a communications gap between the pure science of potentially instructive non-design disciplines and the more synthetic, intuitive approach of the design disciplines—a gap made extremely difficult to bridge by the usually prohibitive costs of thorough research and post-design evaluation.

More importantly, despite its potential value, the inter-disciplinary approach does not get to the heart of the more fundamental problems which have, in large measure, led to the design professions' many failures. Still to be dealt with is the almost universal conflict between client and user interests. The client for a high-rise office complex is usually a speculative builder who wants maximum usable floor space for minimum dollar investment; the users are workers and visitors who need a responsive environment scaled to human proportions, attractive views, legible spaces, physical comfort and a certain amount of pleasant distraction. For whom does the architect design? The client for a household appliance is a manufacturer who wants to sell the maximum number of units at a maximum profit to his company; the user may be a chronically ill mother of four who needs a specially designed unit that can never be profitable to the manufacturer; or a poor family who needs the service that appliance can provide but should not be induced to go into debt for a lot of frills that increase its sales appeal; or, possibly, a vast market that really doesn't need such an appliance at all. For whom does the industrial designer design?

Equally troublesome is the question of market price vs. social costs. Because the driving force of our economy is to make more of everything available to people at prices they can—or think they can—afford, it is to this end that the talents of most designers are employed. Admittedly it is cheaper to build and rent low income housing designed to grim minimum standards than to subsidize more rewarding high-density environments like Moishe Safdie's Habitat. But what about the social costs? Who ultimately pays for rising crime, family disintegration, and increased ghettoization of the inner city? Disposable cans and bottles are less expensive to produce than returnable containers; but who pays the cost of waste collection, disposal, pollution cleanup, and the general demoralization of living in an environment strewn with litter? Aluminum may be cheaper in a particular application than steel, but its manufacture requires several times the power consumption; who pays the cost of this additional pollution and further depletion of our energy resources?

In an economy that does not account for such social costs, how can a designer say to a manufacturer: " I will not design your gizmo to sell for $169.95 and fall apart in two years. Instead, I will redesign your entire plant operation to recapture all by-products, and then I will develop a different kind of gizmo that will last almost forever, after which it will separate into elemental components that can be easily recycled through a closed distribution system for which you will be partially responsible. The purchase price to the consumer will be $339.95 and you'll probably sell the item slower and make less profit, but this is the real (market plus social) cost of a gizmo and in the long run, it will be cheaper for society than your $169.95 model." It is the great misfortune of today's design professionals that while their clients hold them strictly responsible for achieving unrealistically low market prices, the rest of the world is beginning to call them to account for the escalating social costs associated with their efforts.

Closely related to the conflicts of client vs. user and market price vs. social cost is the functional separation of the design process from decision making and implementation. Long the favorite scapegoat of designers (there is hardly a professional going who hasn't been heard to complain that his proposal was vastly superior to the final product, modification of which was beyond his control), this separation is nevertheless a very real fact and a source of considerable frustration. Indeed, it is not industrial designers, architects, or planners who decide what will be produced and how, but rather corporate officers, sales managers, account executives, real estate speculators, and politicians—a generally uninspired and unsympathetic lot.

A few designers who feel that these are simply the wrong people to be working for have gone off to seek research grants from large institutions, non-profit foundations, and universities. But at the moment such funds are scarce, and even foundation managers can be as poorly motivated and unresponsive as corporation presidents. Meanwhile, many a good man/hour is being invested in the design of electric letter openers in the midst of an energy crisis, and the development of prototype safe cars that will never be built because Detroit executives still believe that "safety don't sell [sic]." Which suggests that designers of true conscience ought to quit their drawing boards and join the picket lines.

Clearly, a number of issues confronting the design professions today are so fundamentally political and

economic that they can never be resolved except by broad social action. Recently, a few younger practitioners and students—particularly in architecture and urban planning but also in industrial design—have eschewed more conventional careers in favor of politically-oriented efforts like community development. But as the current recession and government program cutbacks continue to shrink the job market, many students who just a year or two ago were eager to improve the environment or help the disadvantaged are once again concerned primarily with putting together a good, establishment-pleasing portfolio.

In the welter of all these confusing developments and trends, where do industrial designers find themselves today? All too many find themselves out of work—the victims not so much of outraged consumer advocates and social critics as of an unstable economy. Ironically, the profession that was spawned by one depression is being dried up by another; the high priests of obsolescence are discovering that, when money is tight, they, too, become obsolete. It is estimated that in 1965 there were about 1000 industrial design consultants practicing in Chicago; today there may be 25. A number of large offices across the country and abroad have closed down; many others have cut their staffs to a fraction of their former size or regrouped to form smaller, more specialized firms. Hardest hit have been the independent consultants whose services many cost-conscious clients have pruned from their budgets. The larger corporations are making do with their in-house design staffs, and some smaller clients have gone out of business themselves. Many of the 500 industrial design students graduated in this country every year are dropping out of the profession immediately, some to go on with graduate work in other fields, a few to become artists or craftsmen.

If the economic situation were reversed tomorrow, would all these people be back on the job, or has the combination of recession and raised social consciousness dealt a death blow to the profession? Undoubtedly it has had a sobering effect that will "shake out" some of the more questionable practices. But as grim as the overall picture may appear, there are signs of new and energetic forces at work. The old and somewhat degenerate industrial design could, at last, be dying, but a considerably changed and revitalized profession may be taking shape in its place. It is much too soon to say exactly what this profession will look like when fully matured, but many of its characteristics are already evident in the work of a few designers whose influence could prove disproportionate to their numbers.

It is these practitioners who now constitute the "leading edge" of the profession and whose attitudes and activities indicate what seems to be the only direction in which industrial design, as a viable discipline, can go. Which is not to say that the entire profession is prepared to follow this leading edge; indeed, the vast majority of practitioners are still feverishly applying curlicues to food blenders and will probably continue to do so until the last decal dissolves in the trash heap. But such frivolities are marginal to society's real need for industrial design, and as this need becomes increasingly apparent, the decal boys will be officially relegated, lock, stock and chrome stripping—to the back room of marketing management (which is where they've really been all along).

Meanwhile, those independent consultants who survive the shake-out will have to get down to business, and the first order of this business is to identify and meet the real (as opposed to manipulated) needs of real (as opposed to statistical) people. This means directing more attention to the young, the aged, the handicapped, the chronically ill, the pregnant, the obese, the poor, the socially alienated, and the psychologically unstable—all statistical minorities but together they far outnumber the "average" white, middle-class adults aged 18 to 34 upon whom designers, guided by market researchers, have heretofore lavished their efforts.

The second order of business is to meet these needs with rational, safe, attractive products and service systems that optimize user interaction, enhance (rather than deface) the environment, and avoid both marginal utility and hidden social costs. People really need (some) cars, but not cars that kill, poison the air, occupy unconscionable amounts of space in already crowded cities, and keep people in debt replacing them every two years. A product that has manslaughter, pollution, inefficiency, obsolescence and financial ruin built into it cannot be said to meet anyone's real needs.

The third order of business is to meet these needs with products or service systems that can be manufactured, consumed, and disposed of with minimum depletion of energy and non-replenishable resources and minimum pollution of the environment. This means that all products and systems must be stripped of superfluous embellishments and reduced to their essential components; that materials must be carefully chosen for either rapid biodegradation or economically feasible recycling; that (in most instances) products and systems should be designed for maximum durability, long life, and easy repair; and that all components should separate readily for eventual recycling. It also means that designers will have to be involved in innovating and refining manufacturing processes as well as products, and that they must take an active part in developing both the regulatory machinery and the technological know-how to close our open-ended distribution system.

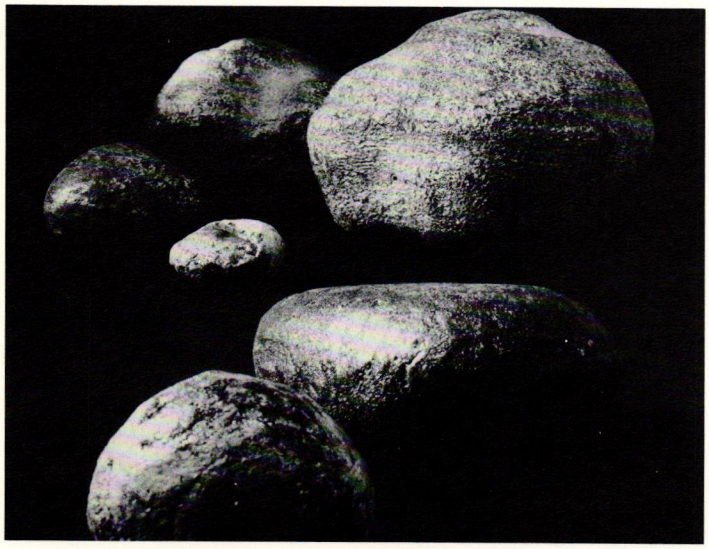
This may sound like an impossibly high-minded agenda, but if industrial designers can't do these things, the profession deserves to die the early and ignominious death its detractors wish it. As the current recession has shown, our economic system can flounder along just as well without the dubious services most design practitioners have been rendering it, and unless designers can turn their skills to upgrading and modifying this system, their function is irrelevant.

To what extent is the profession itself aware of and prepared to meet these challenges? In order to sample industrial designers' own views on these issues, *Design Quarterly* sent an extensive questionnaire to 125 award-winning practitioners and interviewed a number of others in greater depth. Response to the questionnaire was so light—seven to be exact—as to suggest either that an errant postman dumped most of them down a sewer, or that the profession really is as apathetic and self-satisfied as its severest critics claim. So much for the decal boys. But from the written replies and the interviews, it is possible to conclude that at least a small minority of

designers are thinking and working in ways that anticipate these challenges and, in some cases, respond directly to them. A few projects which indicate the direction in which this minority is headed appear on the following pages. These are by no means the only examples of promising design work now underway, nor do all of the designers in this minority share a unanimous approach to the challenges confronting them. Indeed, a number of quite distinct and even contradictory trends can be discerned.

For example, some practitioners are taking what might be described as a cosmetic approach in the non-pejorative sense of the term: downtown rehabilitation, sign control, elimination of visual pollution, conversion of dumps to playgrounds and parks. It could be argued that downtown rehabilitation does not get to the basic problems which have caused deterioration in the first place, and that converting dumps to playgrounds does not alter the fact that communities will continue to generate waste at an ever-increasing rate and dump it elsewhere. It is also possible that phoney mansard roofs are no real improvement over MacDonald's golden arches; that, as Denise Scott Brown and Robert Venturi suggest in their book *Learning from Las Vegas,* plastic and neon have their own esthetic—an esthetic that ought to be exploited rather than disguised or "reformed." But certainly professional commitment to tidying up the environment is a step forward from jazzing up snowmobiles.

In opposition to the cosmetic approach are a number of designers who are trying to gain a better understanding of the design process itself. Some of these people are heavily involved in the development of computer programs for use as design tools—an approach which, although it does not exclude the operation of intuition in the design process, nevertheless makes many conventional practitioners uncomfortable. Other process-oriented designers are placing greater emphasis on human factors engineering. A few professionals are even trying to plug the design process more directly into the socio-economic system by working with neighborhood organizations, pressing for changes in building codes and zoning laws and helping to develop job opportunities in local industries.



3 A retreat to elitist humor, much in evidence in the Italian exhibition, is illustrated here by Piero Gilardi's polyurethane rock seats.

But however divergent these efforts may appear on the surface, almost all are informed by certain common attitudes. The most obvious is a movement away from "visual" solutions, from the practice of design as an "art." Consequently, the output of many of the designers represented in this issue is difficult to describe in the language of traditional design criticism. Instead of the familiar renderings and highly sculptured prototypes, a visitor to one of these offices is more likely to be shown flow charts, systems diagrams, computer printouts and rough, cardboard mock-ups that suggest (but do not fully articulate) physical concepts. The non-visual quality of these practitioners' work betrays a growing conviction that industrial designers ought to be providing their clients with open-ended problem-solving frameworks rather than rigid, self-serving hardware solutions—a conviction which this minority shares with its counterparts in the architectural and urban planning professions. Concern for design as a problem-solving process can also mean, in some cases, direct participation of the prospective user in design development. The success of projects undertaken in this spirit must be measured not against abstract standards of "rightness" or "beauty," but in terms of how readily the framework responds to changing user needs.

Some of the designers represented here have virtually given up product work, and even those whose offices still depend on it for revenue report a marked decline in the proportional share of their time being devoted to it. While partially a result of the current recession, this decline in product work is also a reflection of the previously-mentioned interest in systems design. Simply put, this minority is beginning to tackle problems at a much larger scale than has traditionally been deemed appropriate to the industrial design profession. Instead of improving baggage handling carts, these designers are likely to be studying airport traffic movement. Instead of styling school desks, they might be developing complete lines of integrated educational furniture or even whole campuses. Although such efforts take them deep into territory long considered the domain of the architects, interior designers and urban planners, these practitioners are not really usurping traditional architectural or planning functions. Rather, they are introducing into these other disciplines new approaches which have evolved out of the industrial designer's own particular kind of experience.

For example, an architect normally designs a structural package (the building), the interior of which is then articulated by a space planner who fills it up with individual service components independently developed by various industrial designers. Given the same problem, an industrial designer first assembles the various components—modifying, redefining or innovating these components as need dictates—and then integrates them into a total system that "adds up" to a service package. The advantage of the latter approach is its predication on service rather than structure, which allows the creation of more flexible, responsive facilities.

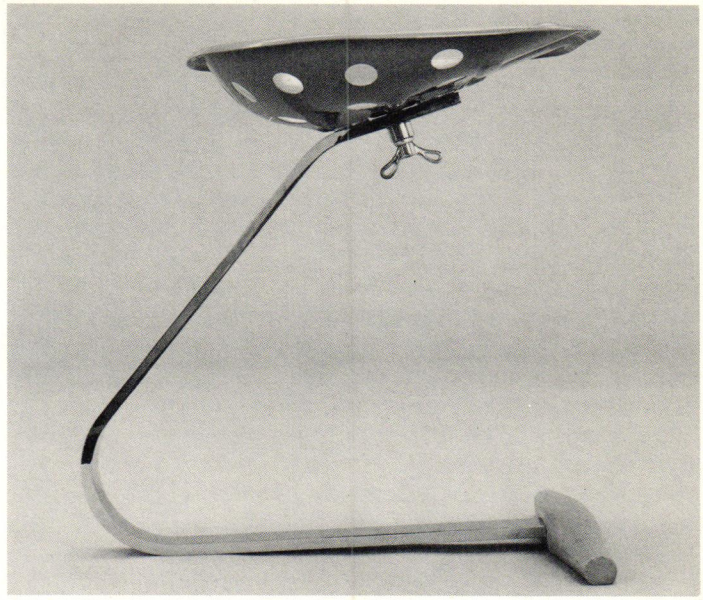
As for the interdisciplinary movement, many of the designers represented here are ambivalent: that is to say, while convinced of its importance, they remain skeptical about just how, in practice, they ought to be relating to

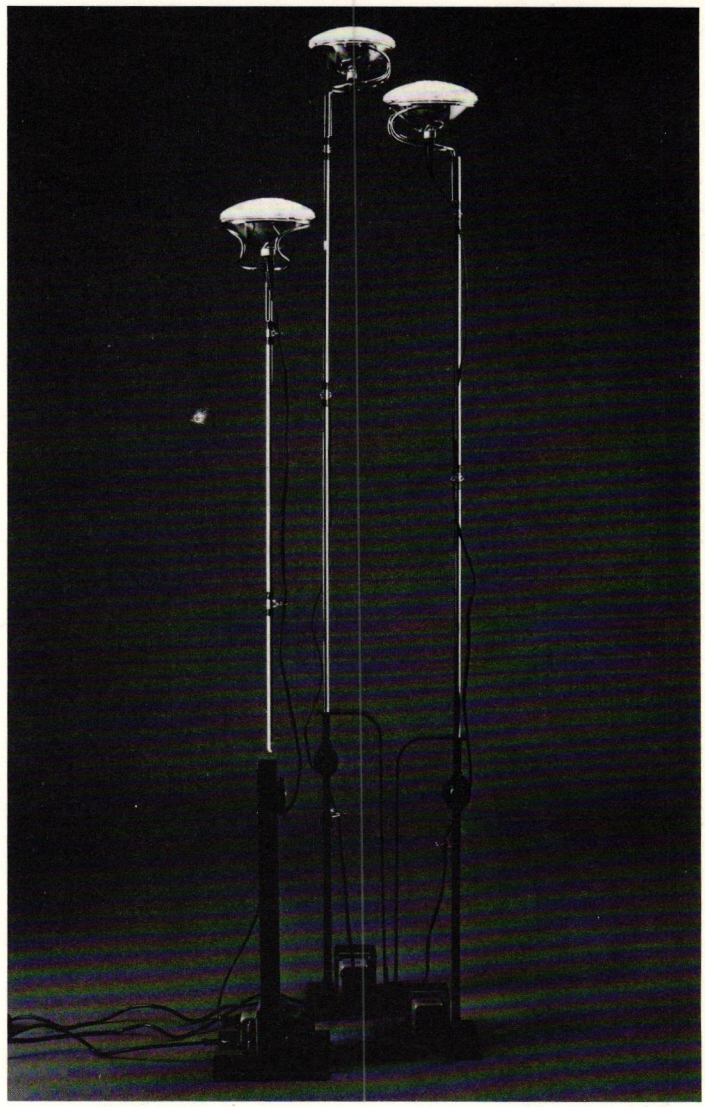
other professionals. One thing is clear, though: the notion of which other professionals designers ought to be relating to has changed radically over the past few years. In a survey of 250 design offices conducted by *Industrial Design* magazine in 1966, the following were listed as the specialists most frequently used on either a consultant or staff basis: engineers, graphic designers, architects, modelmakers, interior designers, market researchers, product planners, plastics experts, electronics experts and physicians (in that order). Today, most thoughtful designers are concerned about how they can work more closely with human factors engineers, sociologists, anthropologists, behavioral psychologists, demographers, human geographers, and computer scientists. Many of the offices whose projects are shown here employ full-time non-designers who comprise as much as 60 percent of permanent staff. A few use non-designers (mostly social scientists) on a project-by-project basis, and even those with heavily interdisciplinary staffs occasionally employ additional consultants. In some cases, staff members are themselves interdisciplinary in that they come equipped with two degrees: one in industrial design and another (usually) in a behavioral science.

Finally, there is a consensus among most of these practitioners that their real function, in addition to design, is education. Education not only of clients, (which has been an objective of good design firms for some time), but also of the user, the general public, and—most importantly—themselves. A crucial element of this educational process is feedback, and some of these people feel that, if the educational process is to be a genuine one, resources must be made available—either from clients or through independent grants—to finance extensive post-design evaluation as a routine part of the design process.

Surprisingly, the practitioners spearheading this leading edge are not mavericks or young designers fresh out of school, fired with the idealism of the late 60s. Although many such young designers do indeed make up a substantial portion of these staffs, the practitioners who now find themselves at the forefront of this movement are mostly mid-career and, in some cases, have been at the top of their profession for the last 20 years.

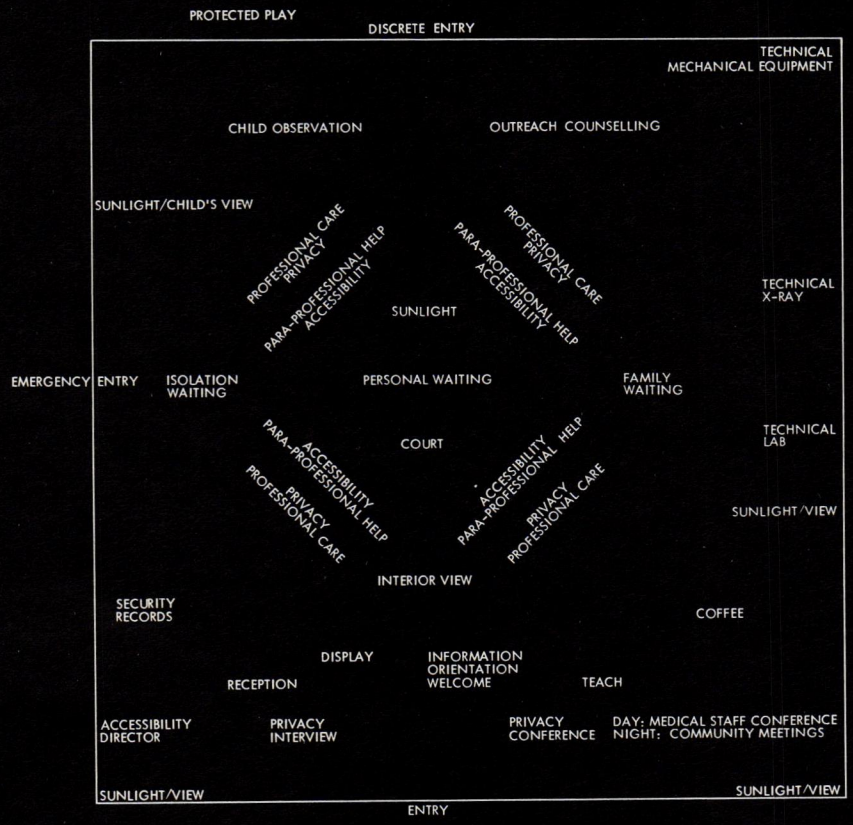
That the profession itself can breed such people is a hopeful sign, but less encouraging are the design schools which, if this movement is to mature, will have to supply an increasing number of graduates equipped to carry forward today's leading edge. Of the 60 or so industrial design programs offered in this country, most are still dedicated to molding students in the old image of super-slick product stylists. There are, of course, a number of schools engaged in quite respectable work, and a few are developing outstanding programs in special areas like computer programing. But it is the opinion of many observers, both within and outside the profession, that there is not one really top-flight design school in this country offering a balanced curriculum that adequately prepares students for the kind of work that must be done.



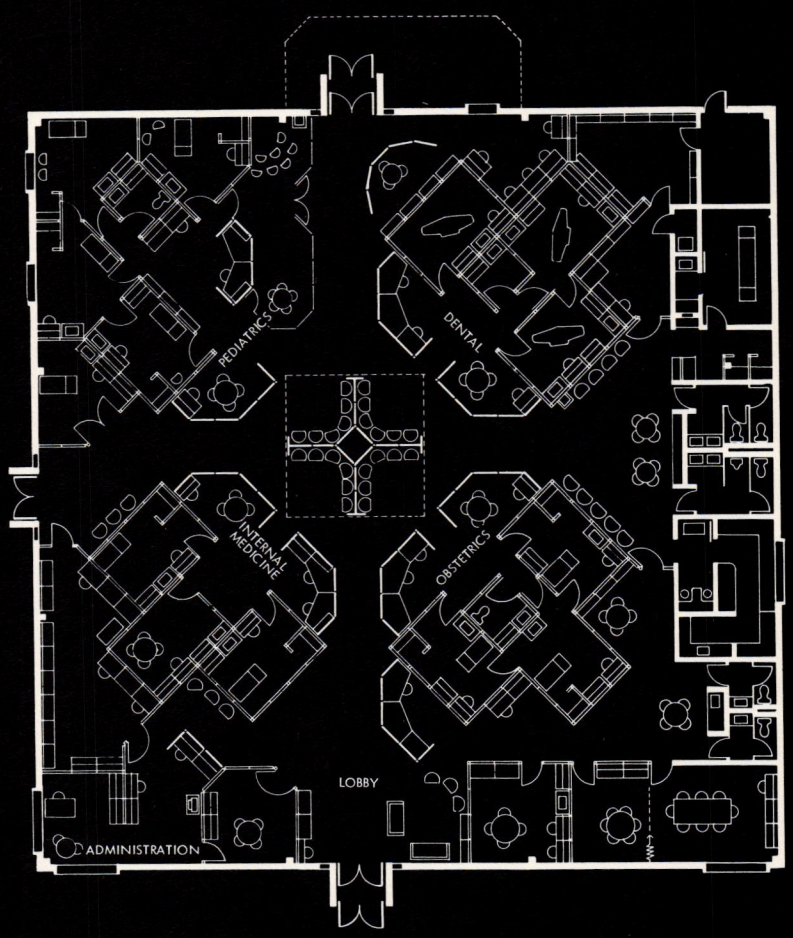


4, 5 Achille and Pier Giacomo Castiglioni's "Mezzadro" seat (top) and "Toio" lamps (bottom) were displayed in the Italian show against a photograph of a junkyard and described in the catalogue as "industrial elements recovered from the surrounding industrial landscape [which] by this recycling avoid the proliferation of new formal matrices." In fact, all the elements in these objects are brand new and the headlights are American, not Italian—a curious example of "ecopornography" in modern industrial design.

Ron Beckman/REDE



6, 7 The physical design for three Providence community health clinics (below) was developed out of the concept "ambiance" (above), which REDE determined to be the critical factor in creating an environment that will overcome the apprehension associated with conventional public health care facilities.



Ron Beckman/REDE

Research and Design Institute (REDE) in Providence, is the nation's first—and, so far, only—independent non-profit design organization set up for the purpose of stimulating local economic development. Chartered by the State of Rhode Island in 1963 (Sen. Claiborne Pell was one of its founders), REDE became operational in 1966, and is staffed by an interdisciplinary team of architects, industrial designers and social scientists who explore the application of current technology to the design of physical environments that will foster desirable social change. Although REDE operates without direct government funding, many of its contracts are with large institutions, public authorities or community groups which may, in turn, finance the development and implementation of REDE's proposals through agencies like HUD.

Characteristically, REDE engages in these contracts on a one-of-a-kind basis, developing comprehensive design programs for community multi-service centers, health maintenance organization (HMO) hospitals, facilities for the aging, student-oriented public educational environments, and "flexible" college campuses. REDE has also undertaken a number of public information projects, including a recent, highly successful exhibition on drugs at the Smithsonian Institution in Washington, D. C. Unlike ordinary consulting firms, REDE does not act in a proprietary relationship to the work it produces (because of its non-profit status it is not allowed to compete in the private sector). Instead, all of REDE's output becomes public information which, it is hoped, will break ground or serve as prototypes for the solution of similar problems. The staff ranges in number between 11 and 25 and is housed in a formerly abandoned Providence mill which—largely as a result of REDE's tenancy—has now been redeveloped. The organization uses consultants on some projects, and at times functions as part of even broader interdisciplinary teams that may include site planners, architects, interior architects, engineers and graphic designers.

Ron Beckman, Executive Director of REDE, studied industrial design at Pratt, architecture at Yale, and psychology in the graduate department of the New School for Social Research in New York City. He was, seven years ago, vice-president in charge of new product development at George Nelson and Company, one of the nation's oldest and most prestigious design firms. From where he stands today, the industrial design profession has never looked healthier. "The best thing that has ever happened," says Beckman, "is the move away from esthetics. We at REDE are not interested in forcing esthetics; for us, design is a social, not a visual art." He views the recent showing of Italian home furnishings at the Museum of Modern Art, (*Italy: The New Domestic Landscape*) as a "summary statement of all that is wrong with design" and a "real threat" to everything positive that the profession has achieved to date. Beckman interprets the juxtaposition of "beautiful objects" and "nihilistic protest" in the Italian show as "the illusion of progress vs. the illusion of futility." For REDE, neither "illusion" is valid. What Beckman's group is concerned with is the reality of social change and the designer's role in bringing it about.

Most succinctly defined, the function of REDE is "advocacy design"—the creation of physical environments (as opposed to discrete products) that serve the interests of user groups, many of whom have heretofore had little serious design effort applied to the circumstances of their everyday lives. "We're interested in why problems must be solved, not just in how to solve them." Starting with the "why" rather than the "how," REDE approaches a problem by first determining the human interactional factors involved, and then allowing a physical design concept to grow out of this determination. Wherever possible, REDE translates these concepts into physical environments by assembling already existing and proven mass-produced hardware rather than by custom-designing special components. Results may be "noncompositional" in conventional architectural terms, but *Progressive Architecture* cited two REDE projects—the community health clinics and the multi-service center—in its 1973 award issue because the jury felt that REDE's work must be recognized for its importance as "process" and as a "design philosophy."

Providence Community Health Clinics

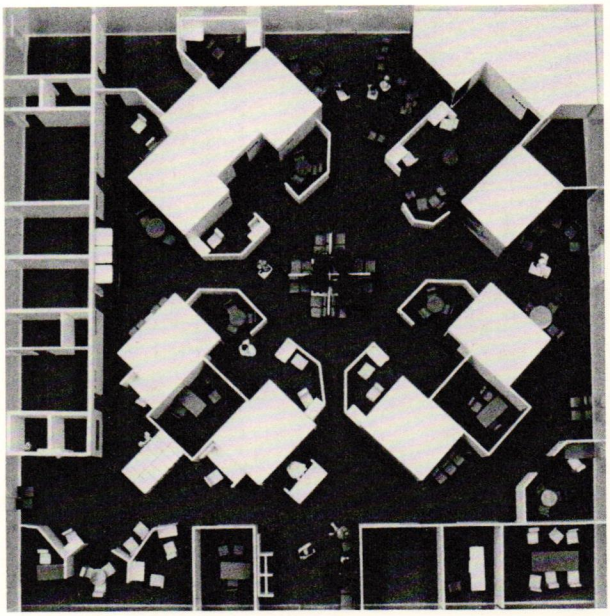
Sponsor: U.S. Office of Economic Opportunity
Client: Providence Health Centers, Inc.
Architect: MacConnell & McLeish, AIA
Designer: REDE. Project Manager: Howard Yarme

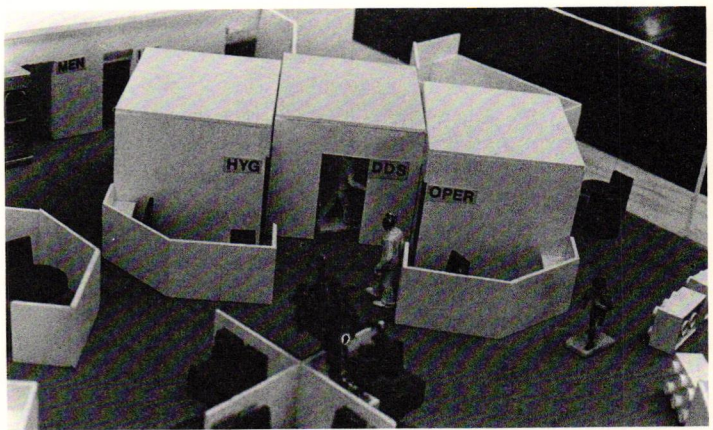
At the moment, there are ten store-front health clinics operating successfully in the city of Providence. A testimony to their effectiveness is the fact that these store-fronts have become a vital part of neighborhood street life and have taken on the more generalized function of community centers. For purposes of providing adequate health care, however, the physical conditions at these store-fronts leave much to be desired. Therefore, OEO is sponsoring a program to replace them with three modern, fully-equipped health clinics. But despite the obvious need for new facilities, the community has been reluctant to give up its store-front operations in exchange for what it fears will be less personalized, more bureaucratic (albeit technically "better") health care. Recognizing the validity of such fears, REDE has designed a physical environment that will indeed provide improved services, but at the same time will overcome the apprehension generated by conventional public health care facilities and actively reinforce the feelings of confidence and well-being now associated with the store-fronts. Hence the determination of (1) sense of community, (2) guaranteed privacy (3) responsiveness to changing needs, and (4) assurance of professional quality in the services rendered, as the controlling factors in this design problem. "These are the ingredients necessary to assure that people needing help will come into the clinics in the first place, will stay once they've arrived, and then will want to come back again," says Beckman. To create this kind of ambiance, REDE has "cued" its proposed facilities with "process"—with people and physical components that will support the productive involvement of those using the environment. The development of interactional concepts (fig. 6) into a physical environment (figs. 7, 8, 9) has been accomplished as follows:

(1) A sense of community is achieved by focusing the clinic on a central, sunlit court open to the ceiling of the structural shell. Staff members are stationed at the entrances to the clinic itself as well as at the entrances to individual service units. The seating arrangement assures privacy while waiting and an orientation to the personnel and services being waited for. Information displays, telephones, interview spaces, and conference space are positioned for maximum people-to-people communication.

(2) Privacy is guaranteed by the clustering of individual self-contained service units (including interview and conference spaces) around the central court (figs. 7, 9). Each unit is installed with independent light, sound, and temperature control to assure a discrete environment.

(3) Responsiveness to changing needs is insured by making each of the independent service units and all partitions, both high and low, movable in relationship to floor and ceiling service grids installed in the structural shell. All furniture and equipment is hung on the walls and partitions. Technical service space for such things as x-ray, is permanently located along one wall and has been oversized to accommodate possible future expansion.





8, 9 Model for Providence community health clinics in plan (above) and detail (below).

(4) A sense of professionalism is conveyed by the interior layout, product components, graphics and structural shell itself—all of which have been designed or selected to enhance the dignity of both patients (children as well as adults) and medical staff. In order for users to easily understand and relate to the services available, each element in the clinic is designed, colored and located so that its function is self-evident. The atmosphere is intended to be one of friendly efficiency reinforced by maximum accessibility and communication.

The result of REDE's effort is an integration of dichotomous spaces that respond to the numerous, dissimilar functions a health clinic must perform. Patients are welcomed, briefed, consulted, examined, treated, re-consulted, de-briefed, and bid a fond farewell in an environment that is open/closed, formal/informal, public/private, clinical/non-institutional, scheduled/spontaneous.

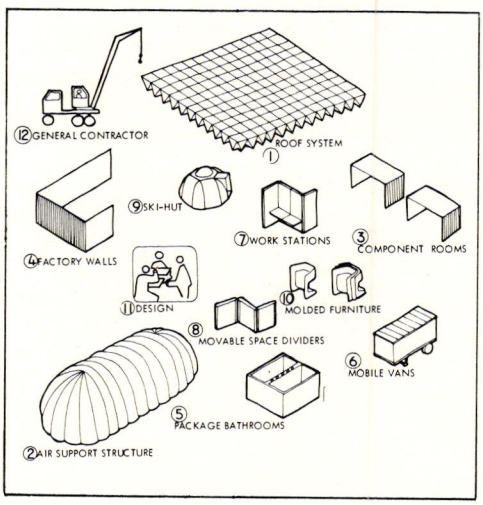
Hartford Park Multi-Service Center

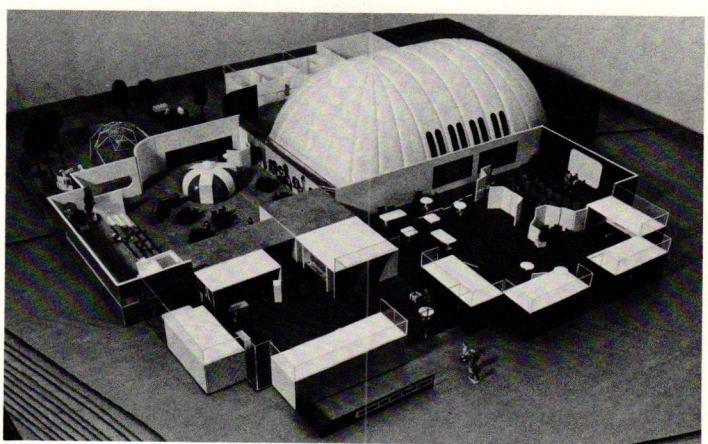
Sponsors: U.S. Department of Housing and Urban Development; Providence Housing Authority; Urban Coalition of Rhode Island; Providence Corporation; Hartford Park Tenants Association
Client: City of Providence
Designer: REDE. Project Manager: Jeffrey Blydenburgh

Back in 1966, the Hartford Park Tenants Association in Providence drew up rough plans for a community center to serve that particular public housing project. Construction of the center was to be financed by a special HUD program, which allots $310,000 for this type of improvement to public housing projects. In 1970, a local architect retained by the Providence Housing Authority estimated the cost of construction at $1.2 million—nearly four times the HUD allotment. After several months of protests, demonstrations, and general unrest, the Tenants Association somehow managed to obtain a set of the architect's plans which it submitted to a local contractor. The contractor estimated the job at $560,000. but HUD refused to ante up the additional $150,000. In 1971 the Tenants Association came to REDE which immediately put together a consortium that joined the forces of the Tenants Association with the Providence Housing Authority, the Urban Coalition of Rhode Island and the Providence Corporation (a local self-help agency). This consortium raised $1,320. to retain REDE which, in turn, put together another consortium involving seven Rhode Island industries who underwrote the remaining cost of developing preliminary plans for a center that could be built within the $310,000. budget. The result: a proposal for a combination space frame and air support structure that has been costed out at $288,000. leaving about $20,000. in HUD funding to be plowed back into programing for the center.

In the development of this proposal REDE has (1) helped a group of public housing tenants to do for themselves what responsible public officials were paid to do but could not accomplish; (2) provided a prototype for construction of civic facilities (schools, clinics, and office spaces as well as other community service centers) at less than one-third the cost of conventionally designed structures; and (3) stimulated the local economy by incorporating into this prototype the products of industries located in the Rhode Island area. This last point is particularly important because since 1950, when the textile industry began its flight out of New England to the Southern United States and Asia, the economy of Rhode Island has been shifting to insurance, computers, tourism, education, and other service industries, by-passing blue collar workers and creating a deepening crisis of poverty, welfare, and public housing. Therefore, the availability of this low-cost structural system will not only make it possible to meet existing needs of communities throughout the state, but will also increase the productivity of participating industries and provide jobs for many laborers who are now unemployed or underemployed.

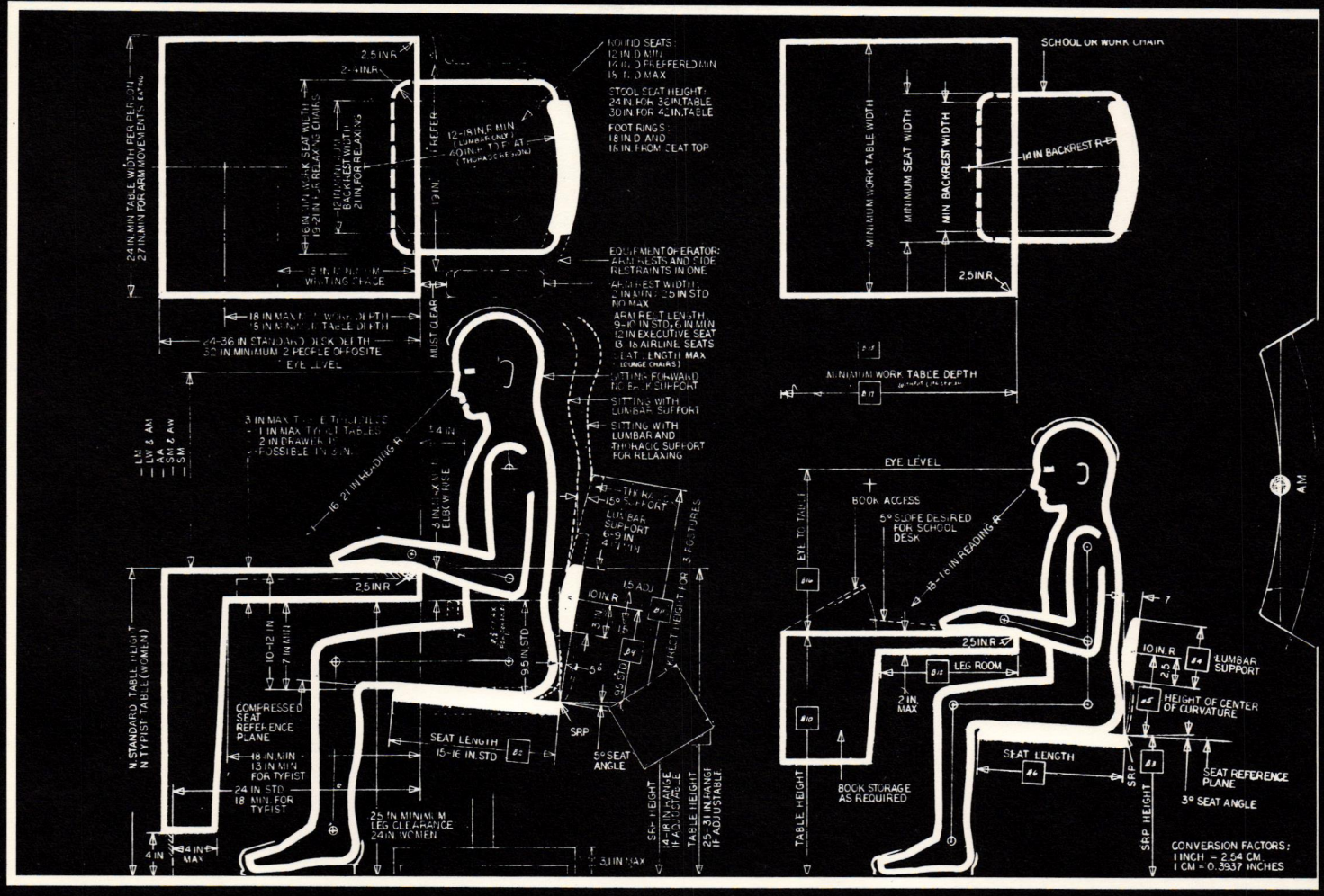
This venture (fig. 10) has translated into a physical environment (fig. 11) components already proven in mass production (an air support structure to house the gymnasium, factory bay construction for the shell, packaged rooms and trailer offices, mobile van additions, space frames, interior partitioning, and furnishings), most of which are designed, fabricated and assembled in New England by New England labor. Consequently, the use of HUD funds to develop this prototype initially for the welfare of one local public housing project can potentially reduce the need for further welfare funding by helping to make the community economically more self-sufficient.



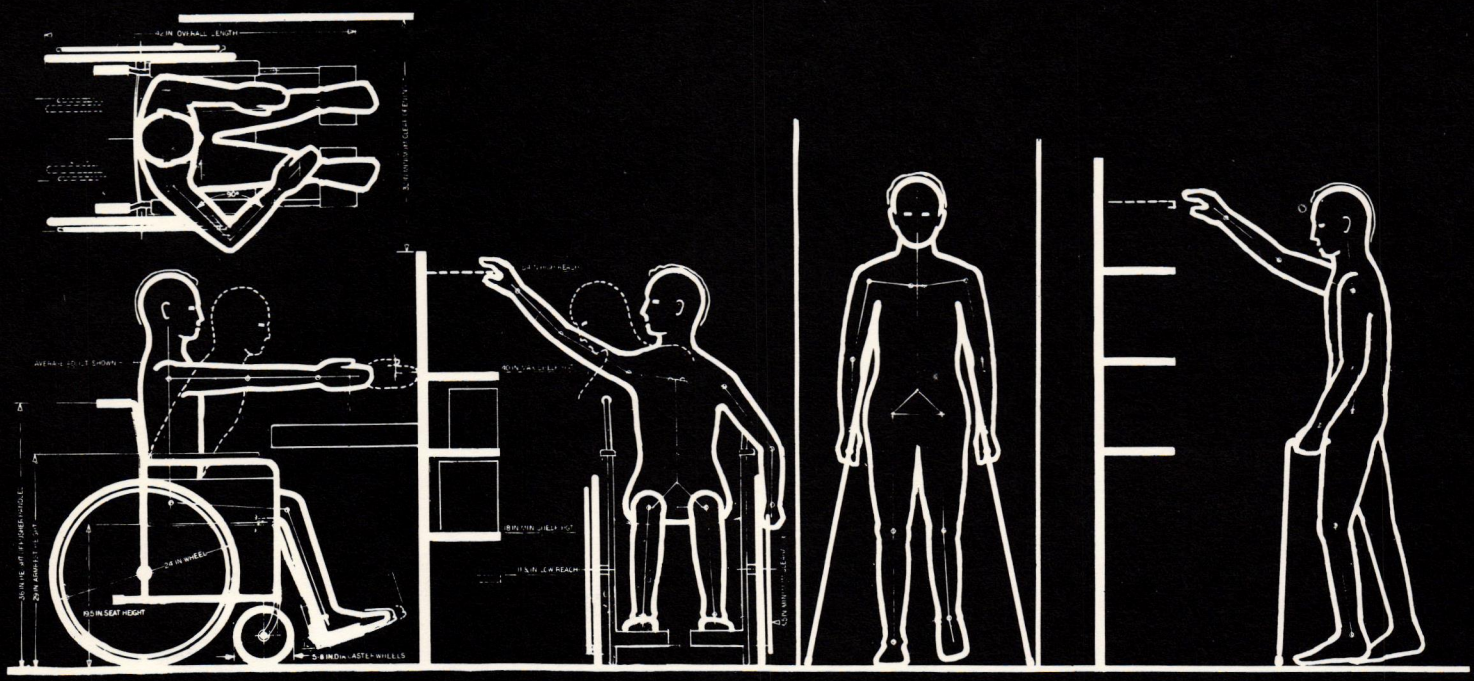


10, 11 A group of locally mass-produced components (above) translates into the prototype Hartford Park Multi-Service Center shown in the model (below).

Niels Diffrient



12, 13 Early mock-ups of two components in Dreyfuss's *Humanscale Atlas.* Above is a selector chart showing table-seating factors for men, women and children; below, a poster showing optimal arm-reach and other mobility factors for handicapped people.



Henry Dreyfuss Associates

Niels Diffrient/Henry Dreyfuss Associates

The emergence of human factors engineering as a formal discipline dates back to World War II when submarines and airplane cockpits had to be built and equipped to function within a critical range of military performance standards and human tolerances. Most of the significant advances since then have been made in Great Britain, but recently an increasing number of American designers have begun to utilize human factors references as part of their routine problem solving procedure. The growing awareness of human factors engineering in this country is in no small measure due to the efforts of Henry Dreyfuss Associates, one of the nation's pioneer industrial design consulting firms. Founded in 1928 by the late Henry Dreyfuss, whose oft-stated aim was to make people "safer, more efficient, more comfortable—or just happier," the firm took an early interest in anthropometry, the science of human measurement. Dreyfuss began publishing compilations of anthropometric data around 1950, and ten years later brought out the first edition of *The Measure of Man,* a portfolio of anthropometric diagrams showing such factors as sight lines, arm reach, and angles of maximum finger pressure.

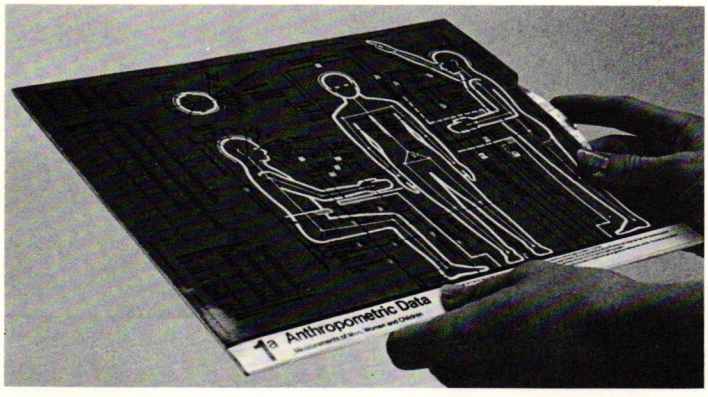
Today the life-sized charts of "Joe" and "Josephine" (Dreyfuss's average adult man and woman) are familiar to most designers, and the firm's interest in human factors has broadened to include proxemics (the study of how people use and structure space) and numerous other fields of investigation into human characteristics and behavior. One of the people now in charge of human factors research at Dreyfuss is firm partner Niels Diffrient, a self-confessed "design generalist" who worked as an architect in Eero Saarinen's office before joining Dreyfuss in 1955, taught industrial design at UCLA, and served as vice-president of the Industrial Designers Society of America (IDSA) during 1971-72. Diffrient's activities at the New York based Dreyfuss firm include a variety of non-consumer projects: aircraft interiors and seating; commercialized and industrialized architecture and interiors; medical, industrial and construction equipment; high-voltage electrical transmission towers and sub-stations. But for the past year, Diffrient's principal commitment has been to the development of what he calls the *Humanscale Atlas*—a series of selector charts (which operate something like slide rules), cards and posters that will make available in an easy-reference format a compendium of human factors data (fig. 14). Like all of the firm's in-house research, this project has been financed out of profits from regular client work. "The governments of most industrialized countries, like England and Japan, subsidize this kind of research," Diffrient points out, "but here designers have to pay for it themselves." In order to take some of the financial burden off the Dreyfuss firm, Diffrient is considering setting up a separate non-profit organization to support further research and publication.

Diffrient's preoccupation with the *Humanscale* venture reflects his strong belief that "designers need to know more about what is good for people, what functions well for them and pleases them esthetically." He feels that critics like Ralph Nader and fellow design practitioner Victor Papanek are "working at the bottom of the scale, defining what is bad about the system but not what is

good for people." In Diffrient's view, it is the consultant's responsibility to "learn more about people, find out how they feel about things, and then design for people's needs within the framework of a client's need to make a profit." As for the current state of industrial design, Diffrient believes that although the "leading edge" of any movement is by nature rebellious, at the moment his profession is "tired of rebellion." "What we must do now is pick up where we left off—with the physiological functions of man."

The *Humanscale* project is an attempt to do just that. It is Diffrient's hope that the *Atlas* will be "but one document in a developing grammar of people's needs, a grammar that can be used by industrial designers, architects, urban planners and all those people who make decisions affecting the environment." Basically the *Atlas* is a condensation and cross-referencing of available human factors information that includes space standards, body clearance requirements, acceleration effects, human strength characteristics, health and safety checklists, and environmental behavior data as well as body measurements and man/machine interface data. "What we're making available in the *Atlas,*" says Diffrient, "is a new set of anthropometric tools; now we want to keep going." In the process of researching the *Atlas,* Diffrient has come across a wealth of non-anthropometric tools that could also be useful to designers: ingenious devices like one which measures eye pupil dilation as an indicator of emotional or esthetic response; numerous psychological tests that could help to determine people's true preferences and feelings. "All of this stuff works," Diffrient claims, "but very little of it is being used because many designers are not even aware that it exists. One of our goals is to help plug this communications gap."

If this gap isn't plugged, if designers don't learn how to manipulate the tools of related disciplines like human engineering, proxemics, and behavioral psychology, Diffrient fears that the problem solving process will be taken over by other professionals. "Designers, by nature, are the people best equipped to function as generalists, and the only valid solutions are generalized solutions. No one discipline has all the answers, even though each has something to offer. And although designers can't become expert in all related disciplines, they can master the essential elements." The first step in this direction is to "reduce specialized knowledge to common language, to some generally useful tool like the *Humanscale Atlas.*" This, according to Diffrient, is what the interdisciplinary movement really ought to be about.



14 Mock-up of *Humanscale* selector chart giving anthropometric data for men, women and children.

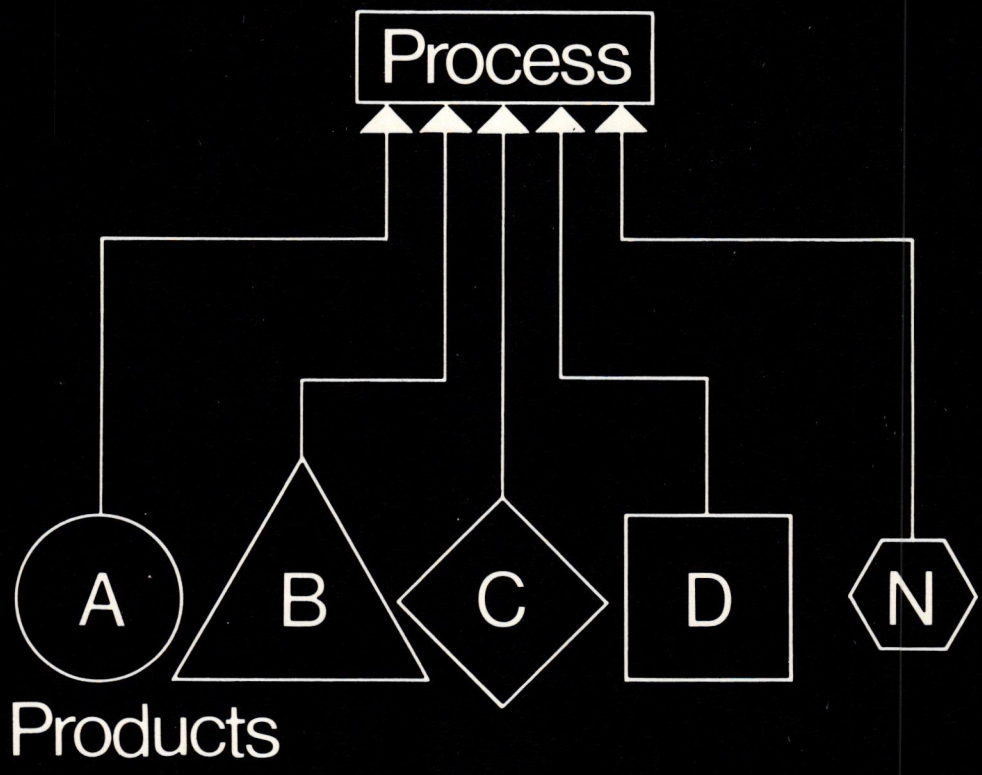
"You can't expect to solve a problem just by putting together a team of specialists from various fields. In order for the interdisciplinary approach to work, you must have an operational generalist to determine the emphasis of the problem solving process. When the designer is not prepared to assume this responsibility, some non-designer who is himself a forceful generalist takes over, and the designer begins to lean on him. That's why it's so important that designers be educated in the rudiments of other disciplines—so that they won't be swayed by the special interests of these disciplines."

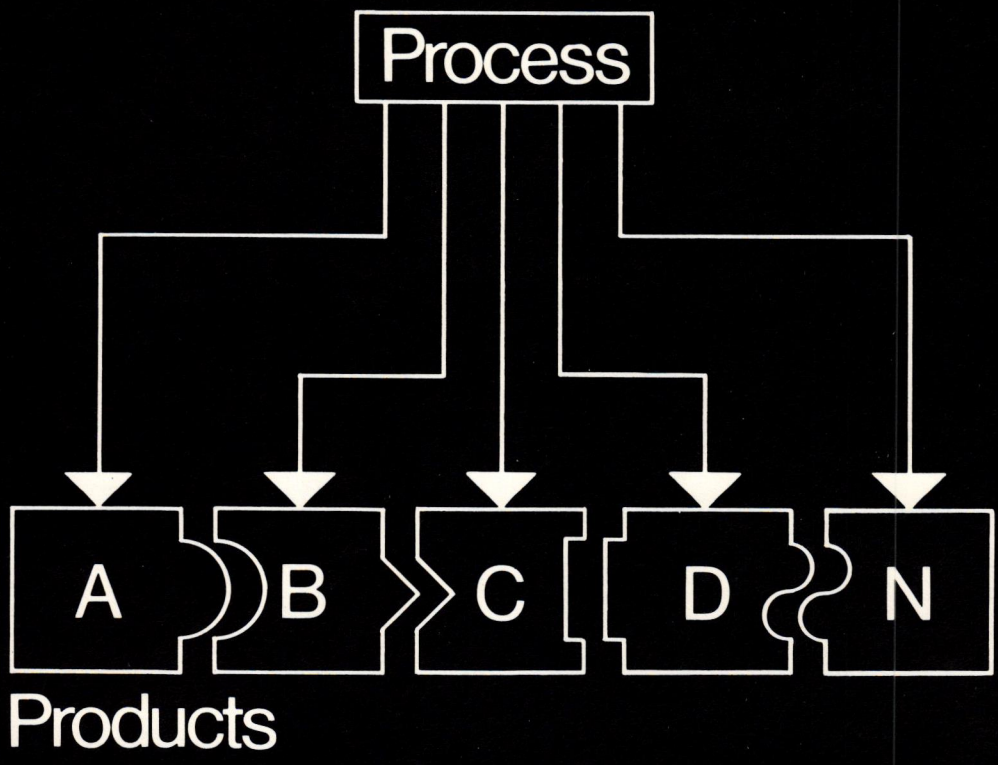
Diffrient admits that such design generalists are a rarity, even within his own firm. "To be a good generalist," he says, "the designer must perfect his basic skills, must be able to do the 'dirty' work. The problem is that many bright, idealistic young designers get so bogged down in perfecting these skills they never come out the other end." Nor does Diffrient believe that the formation of interdisciplinary design offices can compensate for this scarcity of generalists. "Industrial design is going to get off the track," he fears, "if consulting offices are taken over by other disciplines. The thing that holds together a successful interdisciplinary office (like the Herman Miller Research Corporation or the Research and Design Institute) is a strong design generalist like Propst or Beckman. This is because all design solutions must eventually be converted into hardware, into something that works when the user gets it in hand."

Diffrient's desire to preserve the integrity of his profession and see more designers develop as generalists stems from his conviction that industrial design has played a vital role in our society by "sustaining ambiguity and intangible human values in the technological arena. We may quarrel with the superficial aspects of design such as styling, but it must be appreciated that design—even bad design—is often the only subjective, human-oriented factor operating in the technological cycle."

Diffrient also believes that industrial design can be a powerful force in improving the environment. "As Christopher Alexander has pointed out, most people do not respond to the environment at the larger scale of architecture and planning, but rather at the smaller scale of the objects with which they interact on a day-to-day basis. Many spaces, like offices, are not really designed by architects anyway; they're the cumulative product of industrial designers. One of the most effective ways to upgrade the environment is to design better objects to put into it. If equipment and furnishings are made safer, more comfortable, convenient and attractive, then the environment of the person living and working with these objects will, by definition, be enhanced."

Jay Doblin





15 Traditionally, designers deal with one product at a time, which means that consumers have to assemble numerous unrelated products (above) in order to carry out a basic process (i.e. food preparation). An alternative approach is systems design: after the requirements of the process itself have been analyzed, functionally coordinated products (below) are developed to meet these requirements.

Jay Doblin

The progress of veteran designer Jay Doblin's career over the last 30 years is, in many ways, a chronicle of the profession itself. After graduating from Pratt in 1942, Doblin joined Raymond Loewy Associates which, at that time, was one of the largest industrial design consulting firms in the world. For the next several years, Doblin did what most practitioners of the day were doing: straight product design. In Doblin's case, this meant styling refrigerators, ranges and other household appliances for clients like Frigidaire. When Loewy set up its own internal marketing design department in 1952/53 (it was one of the first industrial design consulting firms to make this move), Doblin took over the planning of product lines and corporate identity for large companies like Nabisco and Shell Oil. Then, in 1955, he left Loewy to become Director of the Institute of Design at the Illinois Institute of Technology.

Doblin describes the 40s and 50s as the "deadly years—the years when people thought they knew what design was: an esthetic discipline. I thought I knew, too, and when I first started teaching, I contributed to the fallacy. The trouble with thinking of design as an art is that art is synthetic, object oriented. The artist's response to any stimulus is to make something, and to make it whatever way he wants regardless of the sacrifices. That may be O.K. for the few great talents like Mies and Eames, but it doesn't get problems solved. Look at Mies: he didn't build anything but the Barcelona Pavilion for 40 years."

While revising the curriculum and expanding enrollment at IIT (there were 90 students when he arrived and 350 when he left), Doblin became increasingly interested in developing styling measurements to quantify what designers were then doing intuitively. This was the period when, as Doblin puts it, "market research was just getting warmed up" and people like Dr. Ernest Dichter were revolutionizing advertising and marketing strategy. Doblin proceeded in his efforts to convert styling from an intuitive art to a more rational process by introducing these new marketing research techniques into the design discipline.

It was during this same period that Doblin began a series of investigations in product innovation. The purpose of these investigations was to improve the functional characteristics of labor saving devices like hand tools, typewriters, etc. In retrospect, however, Doblin views this phase as partially a "hangover from the infatuation with things." Typical of the products which his students turned out during these investigations is the grasping tool (fig. 16) developed in 1962. This innovation combines the functional advantage of the forceps (delicacy) with that of the pliers (mechanical grip), while eliminating the disadvantages of both (poor grip and clumsiness, respectively) by properly relocating the lever force. But as ingenious as solutions like this and many others may have been, it became distressingly clear to Doblin that if he gave all 20 students in his third year class the task of innovating a new electrical appliance, each and every one of them could do it. Moreover, most of the commercial design innovations then, as now, were not intended to improve anything, but rather to exploit people's obsessive tendency to identify themselves

through the objects they possess. "Innovation," says Doblin now, "simply leads to higher standards of lower living; it creates a 'slum' of products. Take chairs, for example. At IIT we estimated that there are about 60 chairs per capita in this country. So we designed the 'kangaroo tail'—a portable chair something like a shooting stick that each person can carry around with him, thereby eliminating the need for millions of chairs, most of which are unused at any given moment."

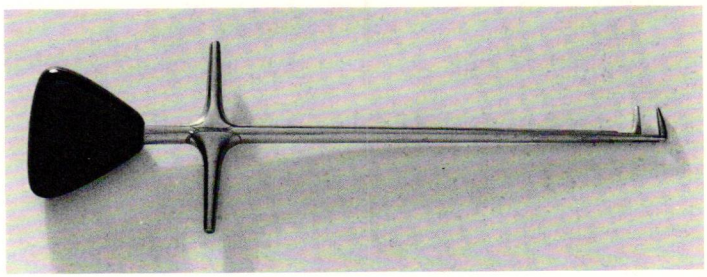
This was the beginning of product denovation at IIT, a series of student projects aimed at getting rid of products while retaining the basic services they perform. Doblin identifies three types of denovation—simplification, disposability, and elimination—and, according to him, "it takes much more intelligence, skill and technical insight to denovate a product than to innovate one." Among the many denovations which his students proposed were self-inked rubber stamps (now in commercial use); a plastic card worth $10.00 to replace all the different metal and paper denominations which people have to carry around for daily use (vending machines, cash registers, parking meters, telephones, and taxicabs would just clip off pieces of the card in much the same way that commutation tickets are punched in San Francisco's BART system); an inexpensive, lightweight four-key typewriter (fig. 17) developed by reducing the alphabet from 26 to 15 letters and the letterform to four "bits;" an 18 lb. scooter powered by a 0.5 hp. engine which could carry people at 25 mph, thus denovating urban transport to a minimal vehicle; and a two-piece dinnerware set (fig. 18) consisting of a knife and "spork" (combination spoon and fork) developed with the help of time/motion studies which revealed that most meals can be eaten with just two rather than three instruments, thus making it possible to cut flatware inventory by one-third.

A third series of investigations carried on at IIT in the early 60s involved the rigorous application of logic to simple product analysis in order to arrive at a systematic design process. This phase, which Doblin refers to as scientific product design, can be illustrated by a drinking cup study conducted around 1962. In this study, an extensive list of random factors was boiled down to six social parameters (material, production process, price, decoration, tradition, and thickness/fragility), six esthetic parameters (transluscence, color, sound, taste, weight and form), and eight functional parameters (cleaning, stacking, heat loss, stability, sloshing, filling, lifting and drinking). For a variety of possible cup shapes, each of the eight functional factors was scientifically tested and the measurements analyzed with the help of an analog curve computer. Curiously enough, the optimum shape turned out to be that of the 2000-year-old vernacular Japanese tea cup.

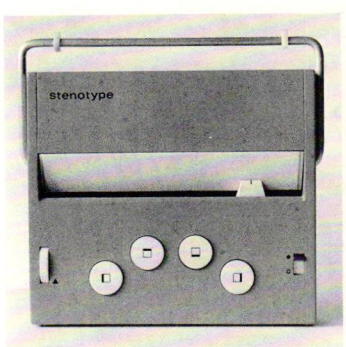
By the mid-60s Doblin and his colleagues had come to the conclusion that coping with one product at a time—even on a scientific basis—was not the way to solve complex problems. The chief limitation of traditional product design, Doblin feels, is that it operates from product to process rather than vice versa. He cites as an example the kitchen, where the housewife must assemble from various manufacturers hundreds of unrelated products in order to "process" (cook) food. Pots won't stack, pans don't fit stove burners and many items can't go in the dishwasher. By reversing the approach—(fig. 15) first analyzing the requirements of the cooking process and then synthesizing products to meet these requirements—the entire system could be redesigned so that fewer products would be needed and the kitchen could be functionally and economically coordinated.

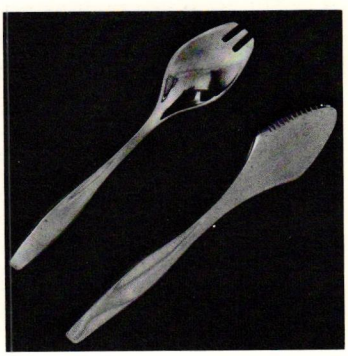
This kind of thinking led to a series of computer aided closed systems design studies at IIT, one of which was the Hydrospace Project: a proposal for a manned undersea production facility that included a deep water fishing operation, a mineral and oil recovery operation and a self-sufficient ocean floor habitat (fig. 19). This study was completed in 1969 under the direction of Charles Owen who was then an assistant professor at IIT and had formerly been a student of Doblin.

In 1969, Doblin left IIT to take over full-time responsibilities as Senior Vice President of Unimark International, a design and marketing consulting firm which he, Ralph Eckerstrom, Massimo Vignelli and several other American and European designers had founded in 1965. From computerized closed systems projects such as the Mercy Hospital sign system developed by Unimark in 1968, the efforts of Doblin and a number of his best students whom he recruited from IIT shifted to multi-systems design. "Systems are relatively easy," says Doblin. "The really difficult problems—and the cause of much disorder and inefficiency—are the *systems of systems* in which various interests compete and conflict with one another. For example, transportation, which is a multi-system near breakdown. There are perhaps a dozen different ways in which people can commute to work every day: on foot, by bike, bus, car, subway, train, taxi—even helicopter. The redundancy and lack of cooperation among various systems within this multi-system have created the mess we're in. We focus on one system by designing fancier and faster cars and this aggravates, not solves, the problem. Unless we



16 Product innovation: grasping tool combines delicacy of forceps with mechanical grip of pliers.





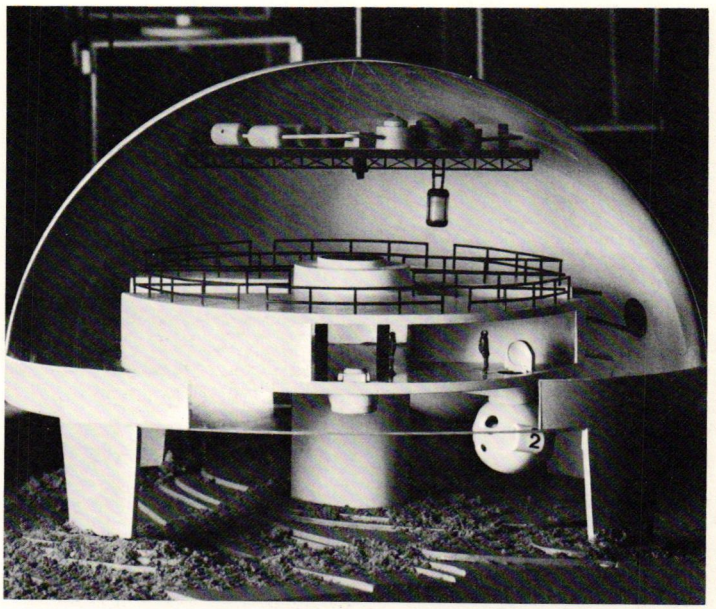
17, 18 Product denovation: four-key typewriter (left) and two-piece dinnerware set (right).

learn to cope with the whole multi-system, we're doomed to live in an ugly, chaotic environment."

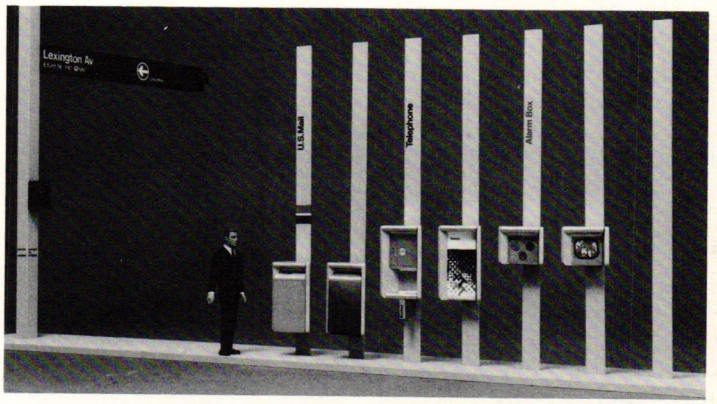
In 1970, Unimark undertook the redesign of the furniture (poles, signs, traffic lights, etc.) along New York City's 53rd Street on a multi-systems basis. Instead of attacking each element separately as a problem in product design, the design team began by investigating the exact role of thirteen authorities—including the telephone company, the U.S. Post Office, and the New York City departments of streets, traffic, public transportation, fire, police, sanitation and parks—responsible for specifying, operating and maintaining the various pieces of hardware. Having determined the jurisdictions, functional needs and cost requirements of each of these authorities, the team developed a preliminary proposal for a single, coordinated system of street furniture designed to the lowest common denominator of these requirements. This proposal was then fed back to all of the authorities involved, and on the basis of their criticisms and suggestions, redesigned until everybody was satisfied. The final proposal: a visually integrated group of furnishings (fig. 20) in which the number of individual elements was reduced, thereby cutting the costs of installation and maintenance and improving the overall appearance of the street.

In 1971, Doblin left Unimark's Chicago office to accept a personal consultancy to J.C. Penney ("it's one of the few organizations that's in a position to take a systems approach, to specify all kitchen components, for example; I'd like to see if you can worm your way into a big establishment machine and do something useful with it") and a professorship at the State University of New York at Purchase where he is helping to set up a new school of art and design. Meanwhile, six young Unimark systems designers have also left that firm to form their own consulting office, the Design Planning Group, for which Doblin now serves as executive consultant and director.

Looking back, Doblin sees the evolution of his own career from straight product design to styling measurement, innovation, denovation, scientific design, closed systems and now multi-systems as symptomatic of what has happened to the industrial design profession at a larger scale. "The synthetic, intuitive approach has hit the ground, "he says, "and here in Chicago we're watching the 'old' design decay before our very eyes. Raymond Loewy closed here in 1961, Chapman, Goldsmith & Yamasaki broke up two years ago and Latham, Tyler, Jensen broke up last year [most of the principals moving on to form smaller offices]. But out of these ashes I believe there is a Phoenix rising. I hesitate to call it the 'Chicago School,' but there is a group of people out here and at IIT who are really on the cutting edge of things." Doblin, who has been described by a number of his colleagues as the "midwife" to this new Chicago School, feels that the future of his profession now depends on which of three roles designers choose to play. "We can assume the role of artists, find patrons and exhibit our formalistic triumphs at the Museum of Modern Art; we can sell out and jingle cash registers at Macy's; or we can solve problems."

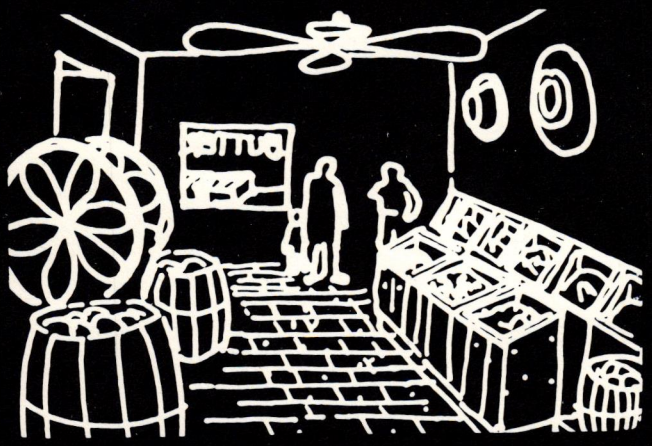


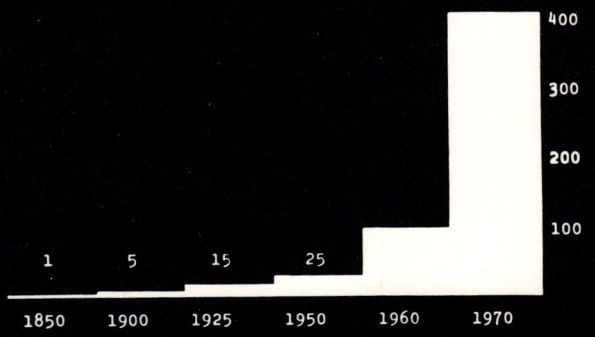
19 Closed systems design: one element of the IIT Hydrospace proposal is a hyperbaric dome which would coordinate ocean floor activities and act as a transfer point between vehicles and an underground base.



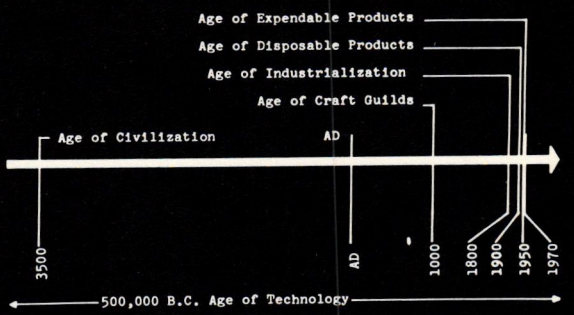
20 Multi-systems design: Unimark's proposal for an integrated system of street hardware for New York City's 53rd Street.

Leonard Singer / Charles Owen / IIT

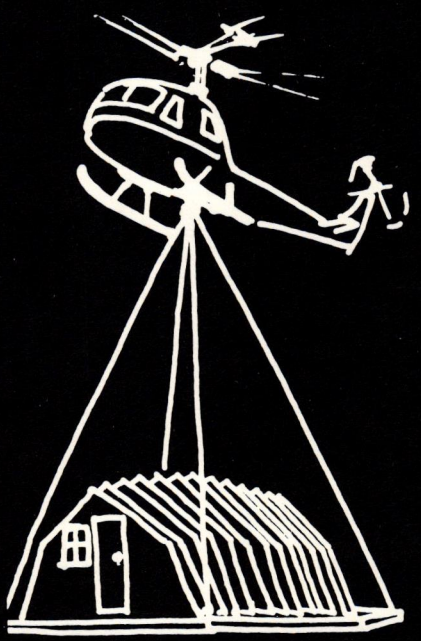


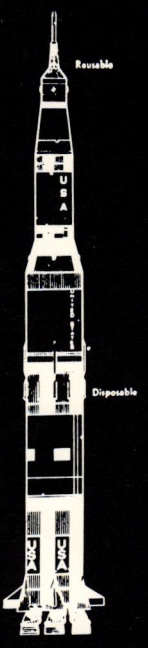


Growth of Disposable Products
by Kind (Exc. Packaging) 1850-1970



The Age of Technology





21 The evolution of disposable products and the accompanying changes in consumer mentality can be traced to a number of historic events, among them the introduction of unit packaging in 1897, prior to which retail merchandising was a cracker barrel operation (top left). Another catalyst was the invention of the vending machine, an early precursor of which was this automatic bar in Paris, circa 1891 (top right). Although disposability is a very recent phenomenon in man's technological development (second left), numerous socio-economic factors have stimulated an explosive growth of such products since 1850 (second right, packaging excluded). But as the trend to disposability accelerates, the problems of waste disposal and environmental pollution intensify. Moreover, cultural continuity is threatened when heirlooms like wedding dresses become disposable (bottom left). Today, even housing (bottom center, Scheldahl paper shelter) and other long-term capital investments (bottom right) may be literally disposable.

Leonard Singer/Charles Owen/IIT

Leonard Singer and Charles Owen are two young industrial designers whose interests and evolution as professionals exemplify, in different ways, some of the changing attitudes toward design among professionals today. Both are now teaching at the Illinois Institute of Technology (IIT) Institute of Design in Chicago where Singer is an assistant professor, Owen an associate professor.

In addition to numerous systems projects at the Institute (including one on baggage handling at Chicago's O'Hare Airport and another on public men's rooms) and at other universities where he has taught, Singer has been engaged for the last several years in a major study of disposable products. He is concerned with the cultural as well as environmental impact of disposability, and feels that current attempts to find technical solutions to the problems of pollution may actually accelerate consumption of raw materials and the generation of wastes in our society. "Pollution is measurable and solvable," says Singer, "but the cultural implications of disposability are not nearly so well defined. Disposability is not just an economic phenomenon; it's symbolic of a way of life. One of the unforseen results of ever expanding production in this country has been the emergence of a throw-away mentality." (For another view of the throw-away mentality see *Design Quarterly 76,* "Easy Come, Easy Go.")

Singer believes that, to a large extent, this throw-away mentality has been deliberately inculcated in American consumers by marketing experts, motivational researchers and advertisers who have had to overcome a certain amount of initial resistance to disposable products. Originally disposable products served a positive social purpose: public health reform in an increasingly urbanized environment. But since the introduction of paper drinking cups, shortly after the turn of this century, disposability has been promoted primarily as a stimulant to our mass consumer economy (pre-packaged sterile bandages, disposable syringes, and other sanitary items being notable exceptions). At the same time, the trend to disposability has threatened many people's sense of cultural continuity, a continuity that in the past had been tangibly reinforced by the handing down from one generation to another of wedding gowns, household objects and personal possessions. In order to make disposability palatable, advertisers had to sell the public on the virtues of convenience and the desirability of change for its own sake; in short, had to persuade consumers to give up traditional cultural values in exchange for a throw-away mentality.

The combination of this new mentality and a post World War II economy in which consumption was elevated to a patriotic duty gave rise to another phenomenon closely related to disposability: the expendable product. Unlike truly disposable products (in which category Singer includes only such items as sanitary paper towels that cannot be used more than once without some functional impairment), expendable products include items that are treated as disposables but, in fact, can be reused many times over (e.g. plastic picnicware) as well as highly competitive mass market merchandise that is actually cheaper to replace than repair (e.g. Timex watches). According to Singer, the economics of expendability

have become increasingly attractive as American labor has been outpricing itself and leaving behind a vacuum that can be most easily filled by the manufacture of products having little or no integrity. Moreover, industrial designers have been delighted to help fill this vacuum—and thus reinforce the throw-away mentality—by building artificial obsolescence and deception into products and packaging. "What we call 'styling,' " says Singer, "is really just an attempt to substitute pseudo-improvements for functional improvements in an economy where tooling up for mass consumption has become terribly expensive."

But if the American economy is now dependent on the throw-away mentality—on ever shorter product life and ever greater comsumption—how can designers help to alleviate the social and environmental problems which this syndrome creates? As Singer notes, proposals to restrict the manufacture of disposable products have already been dismissed by both government and industry on the ground that this is simply not practical, and designers themselves have been "too close to the line of fire" to put the problem into its proper perspective. If disposability is here to stay, Singer suggests that designers must first of all develop a keener awareness of the cultural implications of this phenomenon. "We must understand that disposability is now one of the essential criteria for most design solutions, which means that we have to build 'recyclability' into products at the very beginning of the design process." Part of the solution lies in a more careful selection of materials. "We must stop substituting non-biodegradable materials (like certain plastics and aluminum) for biodegradable materials (like paper and wood) in disposable products. In short, we must stop thinking of ourselves as mere 'sales tools' and begin to acknowledge responsibility for the social and physical consequences of our work. Most importantly, we must prepare to play a more effective role in environmental quality management."

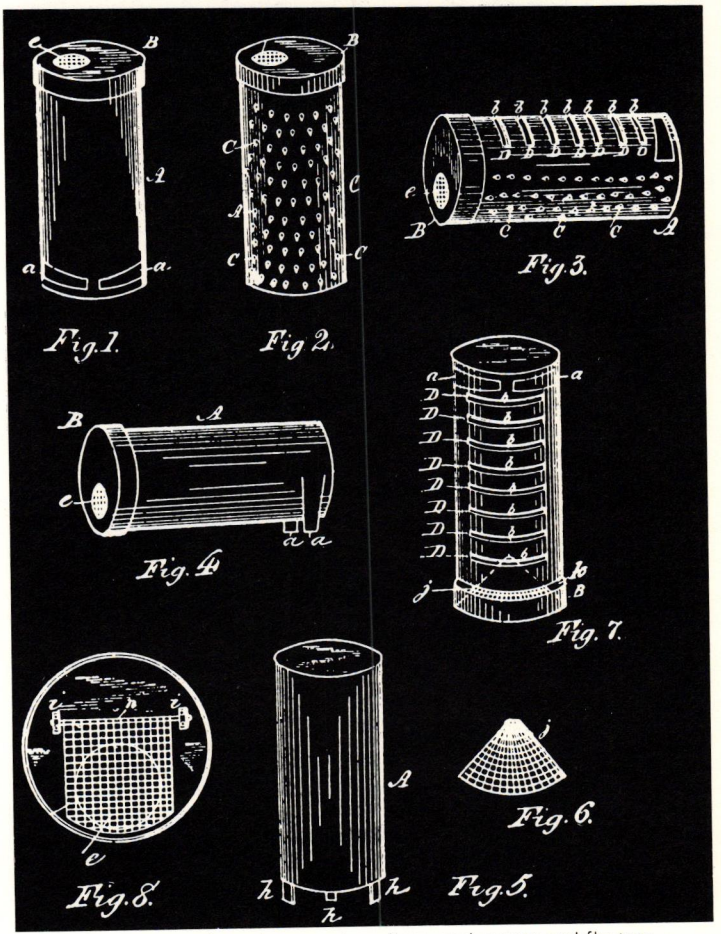
To implement this role, Singer proposes that designers align themselves with consumer advocacy groups to produce an ethical code "based not on advancing clients' selfish interests, but on an agreement to refrain from enterprises that are harmful to the environment or detrimental to the public welfare." Singer sees such an alignment as possibly taking shape in a new Federal agency—"perhaps a 'Department of Design Affairs' within the Department of Health, Education and Welfare but not within the Department of Commerce." The purpose of such an agency would be to define problems, determine social objectives ("if that is possible") and establish design criteria on the basis of which legislative proposals could be formulated. Such an agency could also sponsor open design competitions and award contracts to manufacturers submitting the lowest bids consistent with the agency's criteria—a common procedure in many European countries.

To complement this Federal agency, Singer sees the need for an independent "Center for User/Product Relations" which he recommends be set up as a joint venture by the Industrial Designers Society of America (IDSA), Human Factors Society (HFS) and Packaging Design Council (PDC). Among other services, such a center could provide a free library and director of subscribing consultants in the life sciences.

Finally, Singer proposes that the Industrial Design Education Association (IDEA) be resurrected from the IDSA subcommittee in which it is now buried. The objectives of this committee, he believes, should be to orient designers from marketing research to behavioral research, and to bring human factors engineering and the more formalistic design disciplines closer together. He recommends that the IDEA promote design school curricula that stress psycho-biological studies, product and environmental safety, product recycling and disposability, and the social implications of the design process. "Many of the limitations of today's practicing designer," Singer suspects, "are the result of an emphasis on trivial commercial problems in the classroom."

Charles Owen, who is now responsible for IIT's graduate program in product design agrees. It is this sort of emphasis, he believes, that has bogged down the industrial design profession in a "can't-see-the-woods-for-the-trees mentality." As a very graphic example, he cites the "mad inventions" of the early industrial era (fig. 22) which have their modern counterparts in the Edsel, the Lustron House, "vertical slum" public housing, the new city of Brazilia and the aircraft carrier John F. Kennedy. "This is what happens," he says, "when you design something without any understanding of the complex social and economic systems in which it must function."

As for the million-of-a-kind philosophy which underlies most commercial product design, Owen feels that it is just not valid in a post-industrial society. "From now on,



22 Combined grocer's package, grater, slicer, and mouse and fly trap. Patented July 6, 1897.

the market is going to be for flexible, adaptive systems into which a variety of components can be plugged. Traditional design consultants don't stand a chance. Even if they manage to dig up a few buggy whip manufacturers here and there, they'll just be doing little styling jobs for them. What will happen is that corporate designers will design new products after they've been developed by interdisciplinary systems planners." Elaborating on the need for interdisciplinary process, Owen continues: "You simply can't take a systems problem and slice it vertically according to professional discipline; you've got to slice it horizontally according to how the problem is to be approached. This means that the distinctions between industrial designers, interior designers, architects, and urban planners will become increasingly blurred—that they'll all function together as synthesizers (the role for which they are best equipped) at the core of a design process that will be informed by sociologists and other analysts who, in turn, will be served by information specialists like journalists and researchers. But for this to happen, we need problem solving methodologies that have no disciplinary bias. That's what we're working on here at the Institute."

Problem solving methodologies at IIT are developed in micro-environmental settings, not within the context of product-oriented projects. The process begins by analyzing the activities, behavioral patterns and attitudes associated with a particular setting using as an analytical tool several computer programs which Owen himself has developed as an extension of Christopher Alexander's work (see *Notes on the Synthesis of Form*). The distinctive feature of these programs, one of which has been used by the Herman Miller Research Corporation, is their capability of processing qualitative as well as quantitative data, thus enabling the computer to support valuative decisions. On the basis of this analysis—plus a search of the literature—new design criteria for these activities, behavioral patterns and attitudes are formulated, and new solutions generated from these criteria. Only if the solutions require new hardware are they then translated into product designs.

Owen, who studied computer science at the University of Chicago (he also has a bachelor's degree in chemistry, a master's degree in product design from IIT and has done graduate work in urban planning at Johns Hopkins), has directed a number of such micro-environmental systems studies during his tenure at the Institute. These include a transportation proposal for three Japanese cities (Tokyo, Osaka and Nagoya), a general urban transportation systems project, and development of a model communication system for an urban ethnic community (Pilsen, a low-income Mexican-American neighborhood in Chicago). Recently a team of faculty members and graduate students, headed by Owen, completed the first two phases of a systems project to develop design criteria for new facilities on the IIT campus to house the Institute itself.

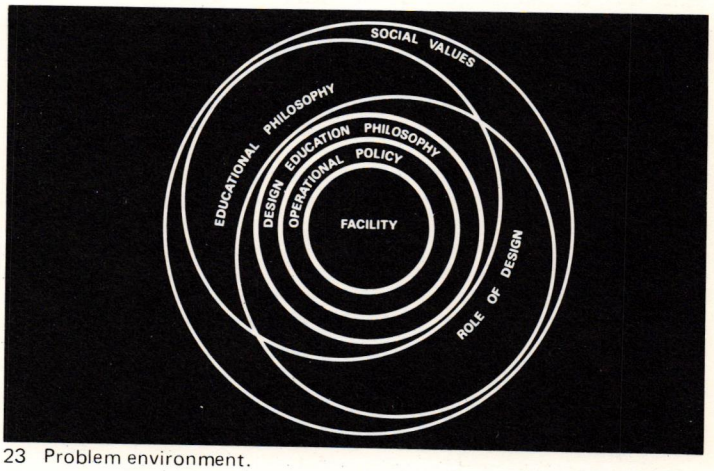
New Educational Facility

Sponsor: ESSO Education Foundation
Client: IIT Institute of Design
Student/faculty design team: James Montague, Sharon Poggenpohl, Kenneth Stevens and Chad Taylor
Project leader: Charles Owen

Design Process Phase I

Context study. The first step in the design process included a description of the problem environment (fig. 23), as well as a student opinion survey, faculty interviews, and a design education study on the basis of which an "operational context" was determined.

Problem element research. All information that had bearing on the project was analyzed into 123 separate "problem elements." Each element was numbered in the order of its discovery and recorded on a form (fig. 24) which noted "problem insight," "extension" (isolation and exploration of the problem), "design implications" and "speculations" (suggestion of possible solutions).



23 Problem environment.

Number 63 **Sources** "The Psychological Dimension of Architectural Space". Progressive Architecture. April, 1965. pp. 159-167.

Interactions 10, 15, 71, 80

Key Words chance encounter, encounter areas, social groups, pathways, lounge

Problem Insight

Because the frequency of involuntary, personal, face-to-face contacts is one of the most important factors in the formation of groups and informal friendships, those areas where chance encounters occur have an important bearing on the formation and maintenance of social groups.

Extension

For most students, exposure to a large segment of the school population is dependent to a considerable degree on chance encounter. Students on tight schedules find it difficult to go out of their way to seek out new acquaintances. Moreover, if the working environments are specialized and compartmentalized, it will be unlikely that new associations will extend beyond a student's habitual orbit.

Design Implications

1. Introduce opportunities for chance encounter in the course of normal daily orbit of movement.
2. Establish a quality of casual, non-purposeful informality in encounter areas

Speculations

1. Corridors wide enough to permit small groups to gather without overly impeding traffic.
2. Lounge areas dispersed throughout the facility to encourage unplanned interaction.
3. Multiple "enriched" pathways to as many areas as possible within the facility.
4. Convenient encounter areas near lecture/seminar/theater areas to accomodate discussion after the event.

24 Problem Element 63 recorded on form.

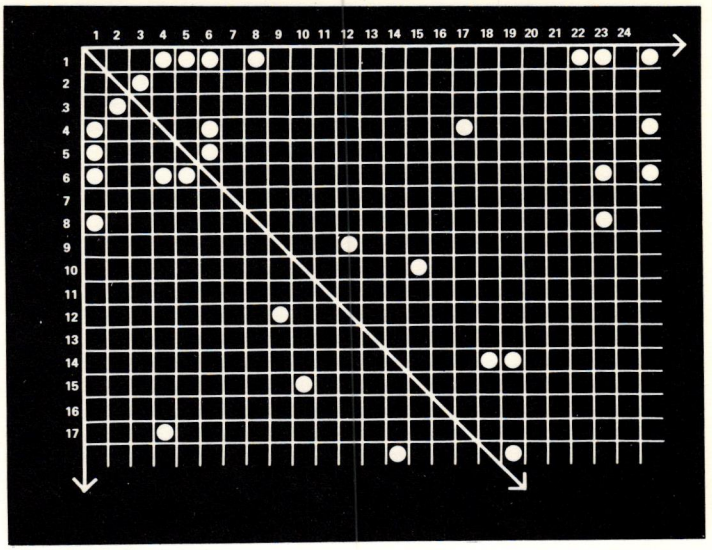
Interaction analysis. In order to establish relationships among these 123 problem elements, the effect which each problem element "speculation" (about 250 in all) would have on every other problem element was considered independently and rated on a five-point scale ranging from −2 ("strongly obstructs resolution") to +2 ("strongly supports resolution"). The "coefficient of interaction" between problem elements was then calculated according to the following formula in which I_{ij} is the coefficient of interaction between problem elements i and j:

$$I_{i,j} = \frac{\sum_{k=1}^{n} w_k \cdot (S_{i,j} g_{i,j,k} + f_{i,j,k} + T_{i,j} h_{i,j,k})}{\sum_{k=1}^{n} w_k \cdot [S_{i,j} s_{i,j,k} + (S_{i,j} g_{i,j,k} + f_{i,j,k} + T_{i,j} h_{i,j,k}) + T_{i,j} t_{i,j,k}]}$$

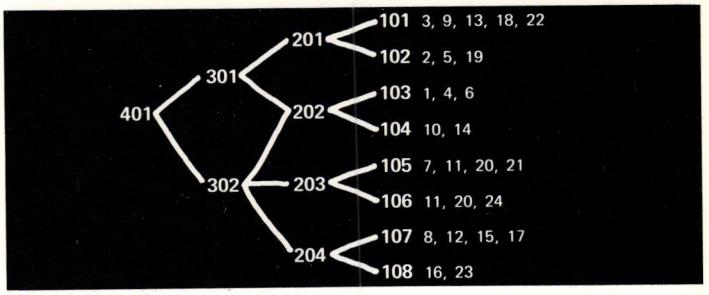
A computer program (RELATN) was written to do this calculation, the results of which were displayed both in matrix form for reference and as a histogram (fig. 25). By looking at the histogram, the design team was then able to make a subjective judgment as to where, in terms of relative usefulness, a line could be drawn between those problem elements that were or were not significantly "linked." The link elements—those with coefficients above the indicated threshold—were then clustered and passed through the RELATN program again to produce both an interaction matrix (fig. 26) and punched cards to be used in the next step of the design process.

Problem structuring. The matrix was also displayed as a link graph (fig. 27) which organized the information on the basis of anticipated design solutions. The punched cards were passed through the VTCON3 program which first decomposed the link graph into clusters or "sets" of problem elements and then structured these sets into a hierarchy expressed as a semi-lattice (fig. 28). The semi-lattice then became the organizational device for the problem structure (fig. 29).

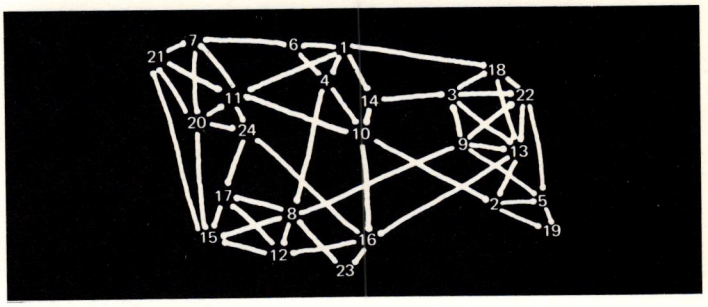
Conceptual synthesis. Each problem element was rated on the pervasiveness of its design implications, and that set of elements having the broadest implications—one which involved the issues of privacy vs. interaction in



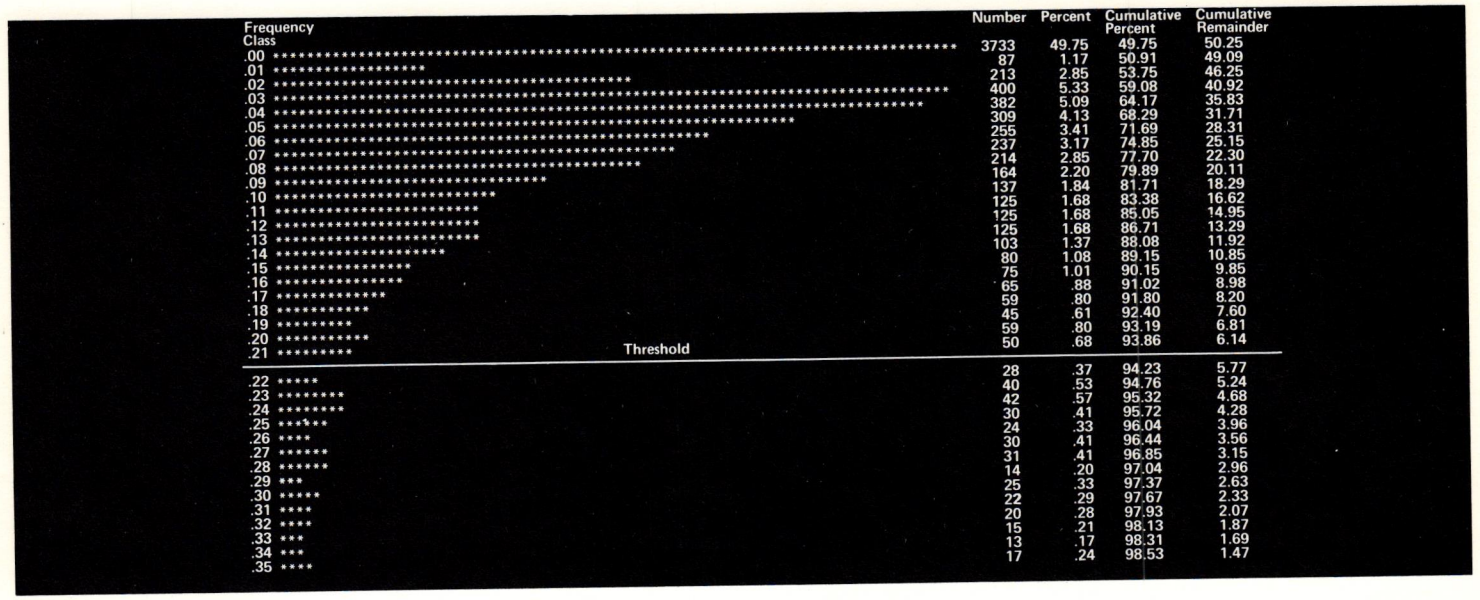
26 Interaction matrix.



27 Link graph.



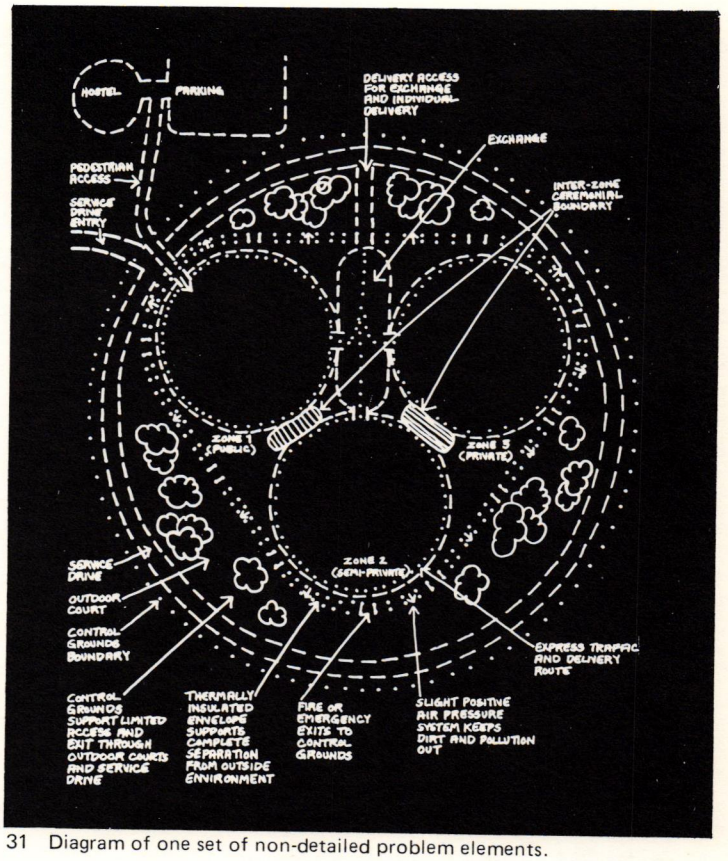
28 Semi-lattice graph.



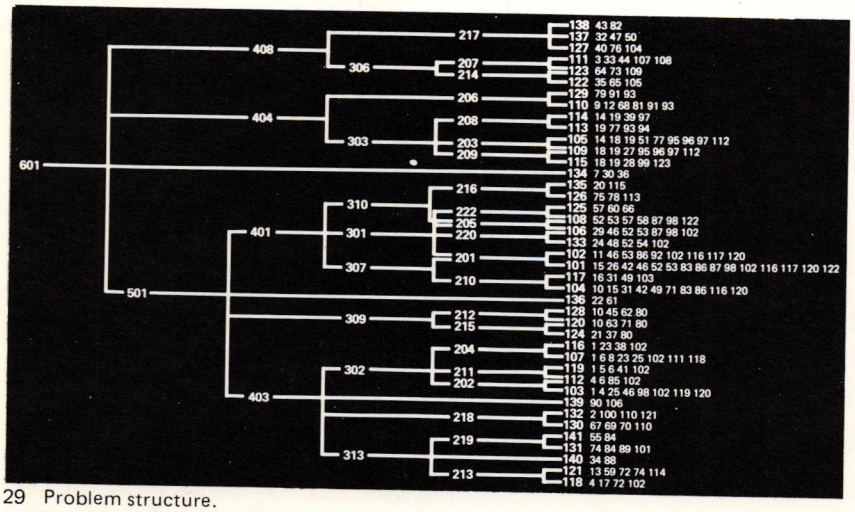
25 Coefficient histogram.

the educational process—was considered first. One example of a set small enough to look at is Set 215 (fig. 30), which is shown here as a matrix with partial solutions noted in those cells representing links between individual problem elements within the set. After all the sets in the entire problem structure had been presented as matrices and processed in this manner, the partial solutions were aggregated into 123 "solution concepts" and given names ("institutional service and repair," "enriched pathways," "personal work space," etc.). In order to keep the design process abstract as long as possible and to allow input from people who were not necessarily visually trained but who had valuable knowledge and ideas to contribute, no attempt at diagraming was made until after verbal concept formation had been completed. Then a diagram for each verbally processed set was constructed (fig. 31), but without concern for design detail.

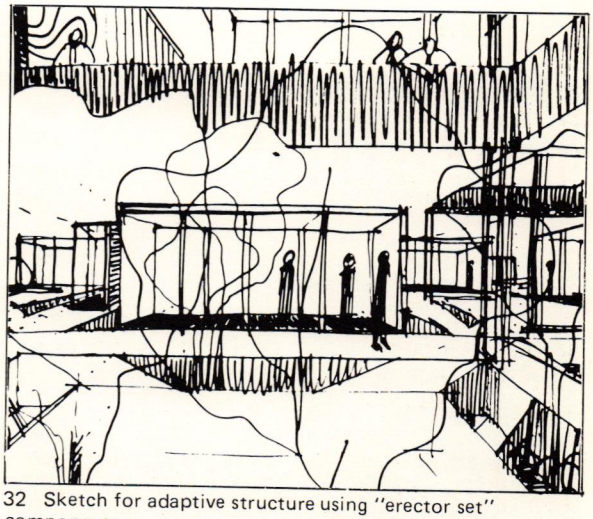
Design synthesis. Moving from the abstract to the more concrete and visual, possibilities for an adaptive structure (incorporating "erector set" structural components, relocatable spiral stairways, privacy blinds within wall sections, large relocatable plantings, relocatable boundary modules, etc.) were considered (fig. 32). Then a model was built to examine space requirements and relationships. Each block of this model (fig. 33) was intended to represent the spatial volume assigned to a particular function, not necessarily to dictate the shape which that volume might eventually take.



31 Diagram of one set of non-detailed problem elements.



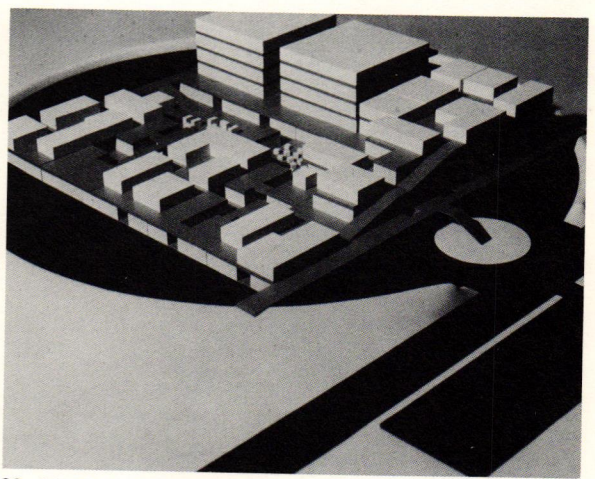
29 Problem structure.


32 Sketch for adaptive structure using "erector set" components.

	21	37	63	71	80
10			Route movement from personal areas to class and faculty areas through interaction areas and by other class areas.	a. Support intra-group interactions: (1) common class areas, (2) team groupings. b. Support inter-group interactions: (1) common events, (2) visibility, (3) informal courts, (4) personal work space	same as 10 - 71b 71 - 80
21	a. Separate delivery (personal and institutional) from pedestrian entry. b. Position receiving area levels at same height as vehicle platforms.				a. Place delivery areas as close as possible to destinations. b. Specialize delivery areas to encourage use for delivery only. c. Route movement through public areas to encourage interaction and visibility.
37					a. Locate delivery area near Materials Resources Center (buy, borrow, rent). MRC attendant monitors delivery area. b. same as 21 - 80 a & b
63				same as 10 - 63	same as 10 - 63
71					Locate personal work areas in the facility to encourage interaction between students and interaction between students and faculty.

Set 215

30 Solution requirements for Set 215.


33 Model built to examine space requirements and relationships.

Design Process Phase II

One of the advantages of using the computer as a tool in design development is that the design process can be recycled as often as necessary with considerably less effort in each successive round. This can greatly enhance the process by making it relatively simple to incorporate feedback, check original findings and continually refine the design program.

Evaluation and problem element research. At the completion of Phase I, the project was presented for critique and expert evaluation. Additional information was gathered and 23 new problem elements were introduced, bringing the total number of problem elements to 146.

Interactional analysis and problem structuring. These steps were essentially a repetition of Phase I, except that "solution concepts" were substituted for the earlier "speculations." The results of this recycling were a greatly reduced number of new design considerations and a check on the "fit" of the original "solution concepts."

Conceptual modification and design modification. The revised, extended list of "solution concepts" was organized into approximately 57 separate "solution elements" (fig. 34), each of which was analyzed in terms of five characteristics labeled "abstract," "discussion," "essentials," "resolved problem elements" and "related solution elements," which were necessary to the final solution. These notations provide the background for specific design ideas that could be used if better ones are not forthcoming.

Solution specification. These 57 "solution elements" have become the problem statement for the next phase of the design process which, in architectural terminology, will be the "building program."

Design Process Phase III

At the moment, Owen and his group are writing up the results of this project through Phase II in the hope that the originality of their work will attract additional funding for Phase III: design and construction. The procedure for Phase III will be to hand over the "solution specifications" to an architect with whom Owen's group can collaborate in developing the final structural concept. Since the Institute is now next in line on IIT's building program, Owen estimates that construction of the new design school could begin in about two years.

Solution Element 2

Adaptive Structure

Abstract
Within the envelope, the primary structural system is a three dimensional grid of platforms and columns. These, as well as ramps and stairways, are demountable and may be added or removed with an overhead crane to respond to growth and change in the activities of the facility.

Discussion
Response to change has not been an important feature of institutional structures. On the contrary, part of the desired image for institutional structures has been monumental permanence and security. In the light of the high cost of adapting the "permanent" structure to the changing needs now continually encountered, these values must be stronly questioned. Buildings designed, built and operated under an essentially "first cost" philosophy a generation ago can no longer operate successfully. The high cost of labor and materials make change costly, and the rapid turnover in wants, needs and capabilities make change necessary. The proper measure of cost today is not "first cost", but "use-life cost". Adaptive structure increases first cost, but reduces use-life cost by greatly enhancing the ease with which the facility can be changed.

Steps toward the flexible structuring of space have been taken almost exclusively in the direction of opening floor space by spanning greater areas without columns. This has led to furniture systems and planning concepts for a more organic approach to floor planning. Perhaps the most widely used approach to furniture systems and planning has been the office landscape concept, which as used by many planners has opened the door to more adaptive ways of using space. Adaptive structure continues beyond the limitation of fixed floors to the addition and subtraction of three-dimensional space. . . .

Essentials
1. Demountable structure which may be assembled and dissassembled with minimum help from outside specialists and little or not outside equipment.
2. A module size for the major grid large enough to span a typical 15 to 25 person space but small enough to be dissassembled, stored, moved and reassembled within the facility.
3. Platform surfaces which may be discontinuous in the major grid and penetrated on a finer grid within the major grid module to allow sunlight through to courts and spaces below.
4. Fixed ceiling-to-floor heights between platforms to permit units of the boundary system to form light-tight, sound-tight spaces anywhere within the structure.
5. Compact component shapes that make good use of storage space.
6. Wide, relocatable ramps to link major paths on different levels; all spaces must be accessible by major path.

Resolved Problem Elements
1, 5, 6, 11, 21, 26, 33, 41, 48, 54, 59, 74, 80, 84, 92, 93, 100, 102, 114, 117, 121, 125, 138, 143, 145, 146

Related Solution Elements

Boundary system	I.D. Exchange
Independent envelope	Deep floor

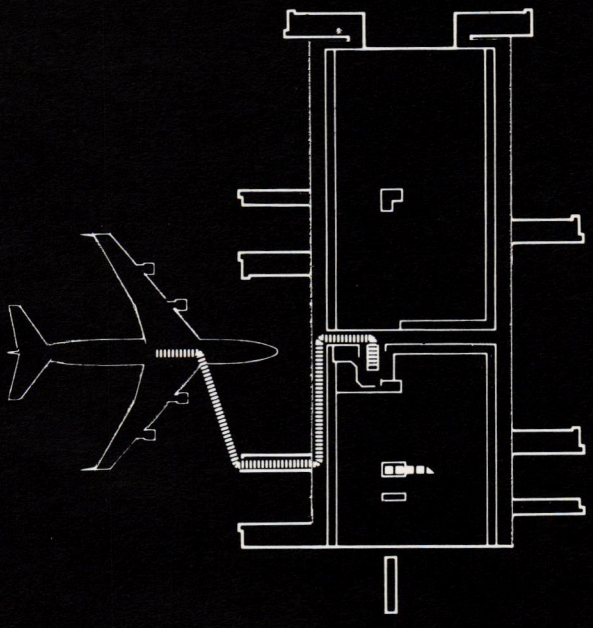
34 Analysis of Solution Element 2.

Gene Tepper

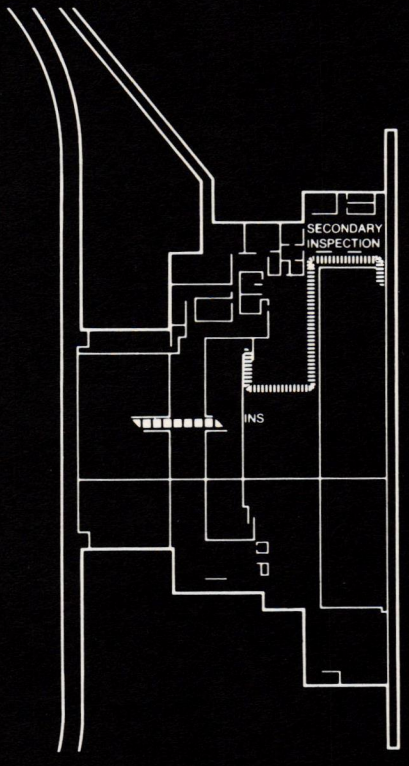
DEPARTING AND DOMESTIC ARRIVALS

INTERNATIONAL ARRIVALS

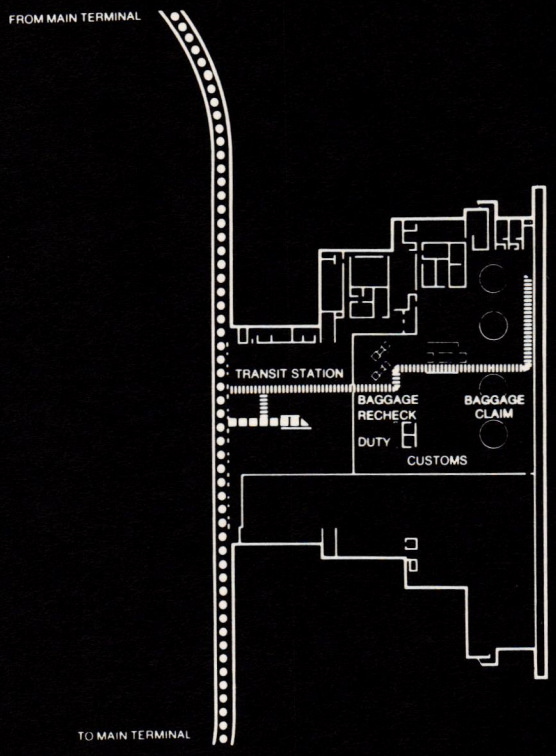
SATELLITE TRANSIT



INTERNATIONAL CORRIDOR LEVEL



FIS MEZZANINE LEVEL



SATELLITE TRANSIT LEVEL

35 Plan of the South Satellite, SEA-TAC Airport.

Tepper & Steinhilber Associates Inc.

Gene Tepper/Tepper & Steinhilber Associates, Inc.

"You can't call yourself a 'non-product designer;' it sounds Alice-in-Wonderlandish." But what better label is there for someone like West Coast designer Gene Tepper who takes the unorthodox view that it is his responsibility to limit rather than increase production?

Tepper began his career in 1945 as an exhibit designer. He established his own industrial design consulting firm in 1951, and in 1963 he and partner Bud Steinhilber opened their present office in San Francisco. Most of Tepper & Steinhilber Associates early work was in electronics products development, with an emphasis on human engineering. Although still active in this field, as well as in graphics and communications, the nine-man firm is now striving to become more involved in what Tepper calls "anti-product" design: a movement away from "product oriented" solutions toward "total problem" solutions that are predicated on "the discriminating use of all resources, including our talents and energies." The "anti-product" approach is intended as a corrective to what Tepper sees as the most serious failing of his and many other professions: complacent "piecemeal" thinking.

"The industrial designer, like most other professionals, has been content to do a technically skillful job on a piece of something—or even a whole thing—without any concern for the ramifications of what he is doing, without any real awareness of the impact that this something will have on the life patterns of the people who are going to use it." He cites as an example the automobile designer who works on hood ornaments, side panels, or wheel details without feeling any responsibility for the overall design of the car or what it will become in the hands of the user. In Tepper's view, the refusal of some practitioners to design cigarette packages, shoddy merchandise that is likely to break or cause injury, or poorly engineered tools that do not provide proper safety controls, is evidence that this sort of complacency is, at last, giving way to an increased awareness of social responsibility. But this, as far as he is concerned, is the very least industrial designers should be doing. Beyond this obvious level of protest, Tepper believes that the designer has special responsibilities—responsibilities that arise out of his active role in production. "Production," says Tepper, "is God. It is also the source of many of our problems. To suggest that production should decrease, that people might be better off having fewer things, is practically un-American."

Nevertheless, that, in essence, is what he feels designers must begin to do: to refuse to work on anything that "has no intrinsic value, that is being produced for no reason other than sales." Tepper admits that determining intrinsic value can be something of a problem. "With the exception of certain basic necessities, there are damn few things people really need; mostly it's a matter of induced want. Market research can tell the designer whether or not a new radio/phonograph in a certain price range, styled for a certain segment of the public, will sell. What I want to know is whether or not the quality of life of that particular segment of the public will be improved by the production of more radio/phonographs. Chances are there is already such a glut of radio/phonographs that the market supply no longer bears any relationship to people's needs."

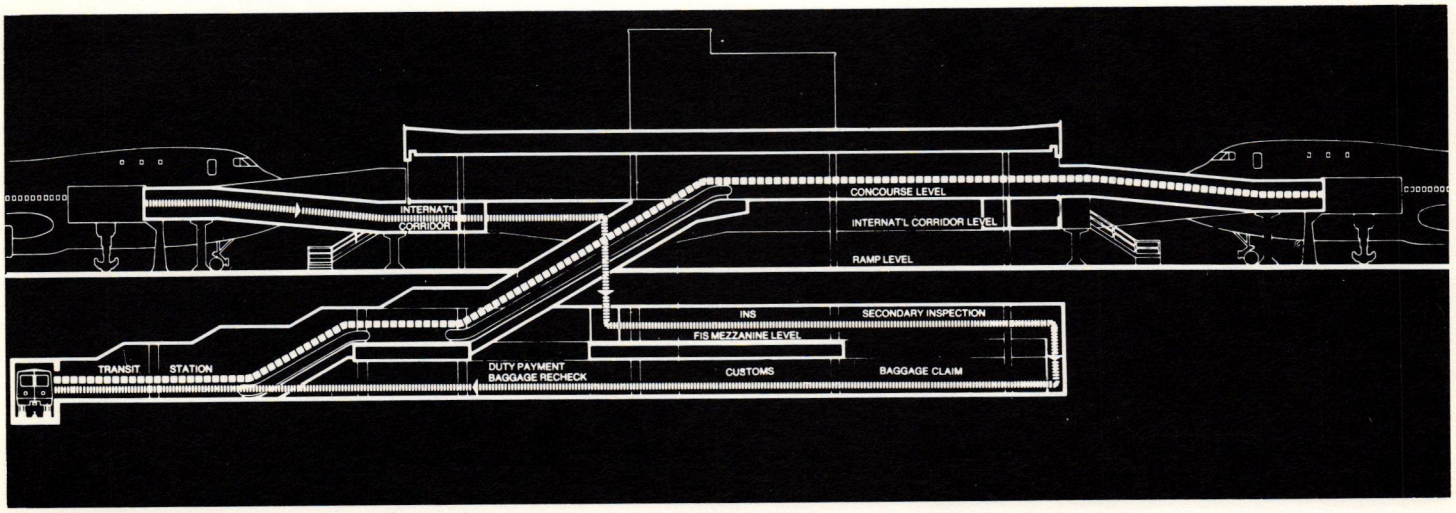
Tepper also questions whether the design of even worthwhile products can be justified if their manufacture requires the use of non-replenishable materials or results in air or water pollution. Where the end of a resource is in sight, Tepper believes the designer must help to safeguard the dwindling supply by specifying its use only for the most essential applications. "What we must begin to do," he says, "is balance the costs of a product or service—including the environmental impact of use as well as the environmental impact of mining, drilling and damming, and the depletion of mineral wealth and energy sources (dammable water as well as fossil fuels)—against the benefits that product or service will offer. And then we must ask who, exactly, will enjoy these benefits? Company stockholders? A few special interests? Everybody in town? The whole country? All our children? All their children?"

Such views have brought Tepper to a position that he finds difficult to illustrate in traditional design terms. "You can't show pictures of products you decided weren't necessary or refused to make for moral or ethical reasons. Nor can you show pictures of uncut forests or unmined mountains and call them 'products.' Even talking about such things is a little hard because we're not used to the idea of non-productivity." But what designers can do, Tepper suggests, is begin thinking of "sideways communication" and "design-as-process." "These are the directions the design profession must pursue if it is to play an effective role in a future worth looking forward to."

By "sideways communication" Tepper means an alternative to the rigidly hierarchical "up-and-down" communication which Alvin Toffler describes in *Future Shock:* a change from bureaucracy to "ad-hocracy." "We need 'sideways communication' to reach our sub-cultures and the developing nations. And we can't wait for someone to tell us to start doing it. We've got to just go ahead and change on our own in order to keep ahead of the rapidly deteriorating environmental and social situation. Perhaps designers in American and other overdeveloped countries can help designers in less developed countries to avoid some of the tragedies of 'productivity-at-the-expense-of-quality-of-life.' It won't be easy—rather like a father advising his son to avoid some of his own more painful experiences. There is a credibility gap, and the lessons must be experienced, not just taught. But at least sideways communcation—designer-to-designer advice—is less suspect than advice coming from one government with a 'high' standard of living to another with a lower standard."

According to Tepper, one of the most important elements of "design-as-process" is the ability to ask the right kind of questions. "It's been said that the art of design lies not so much in the problem-solving as in eliciting the intelligence of the people you're trying to serve. I'm not so sure that it is a matter of eliciting intelligence. Possibly it's more like tapping here and there with a little rubber hammer to elicit reflexes. People will very often describe 'problems' that are really only symptoms of the problems. It takes shrewdness, insight and doggedness to get the information a designer needs to understand a problem clearly."

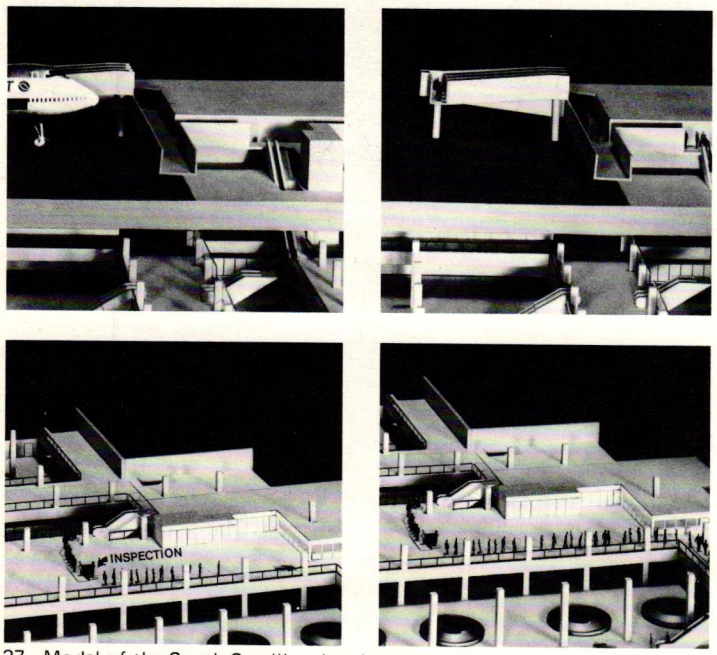
An example of Tepper & Steinhilber's "total problem" approach is their recent study of international arrival and clearance procedures at the Seattle-Tacoma (SEA-TAC) Airport, a project which Tepper himself describes as " an attempt at 'design-as-process.' " The objective of this five-month study, which the firm completed about a year and a half ago, was to improve operational efficiency and traveler convenience. Or, as Tepper puts it, "to conserve human resources—people's time, energy and well being" (figs. 35-38). At the time the study was undertaken, a new physical facility was already under construction and the client—the Seattle Port Commission—assumed that T & S would come up with "typical" interior design solutions: carpeting, furnishings, signage, etc. Instead, T & S took the approach that the problem was not really physical at all, that the existing system was so bad that it couldn't accomplish the purpose for which the facility was being built in the first place. "What the client had to realize," says Tepper, "is that travelers want to spend as little time as possible in this sort of situation. No matter how handsome the physical environment may be, they don't want to stay; they want to get out."



36 Transverse section of the three-level Federal Inspection Service facilities in the South Satellite, SEA-TAC Airport.

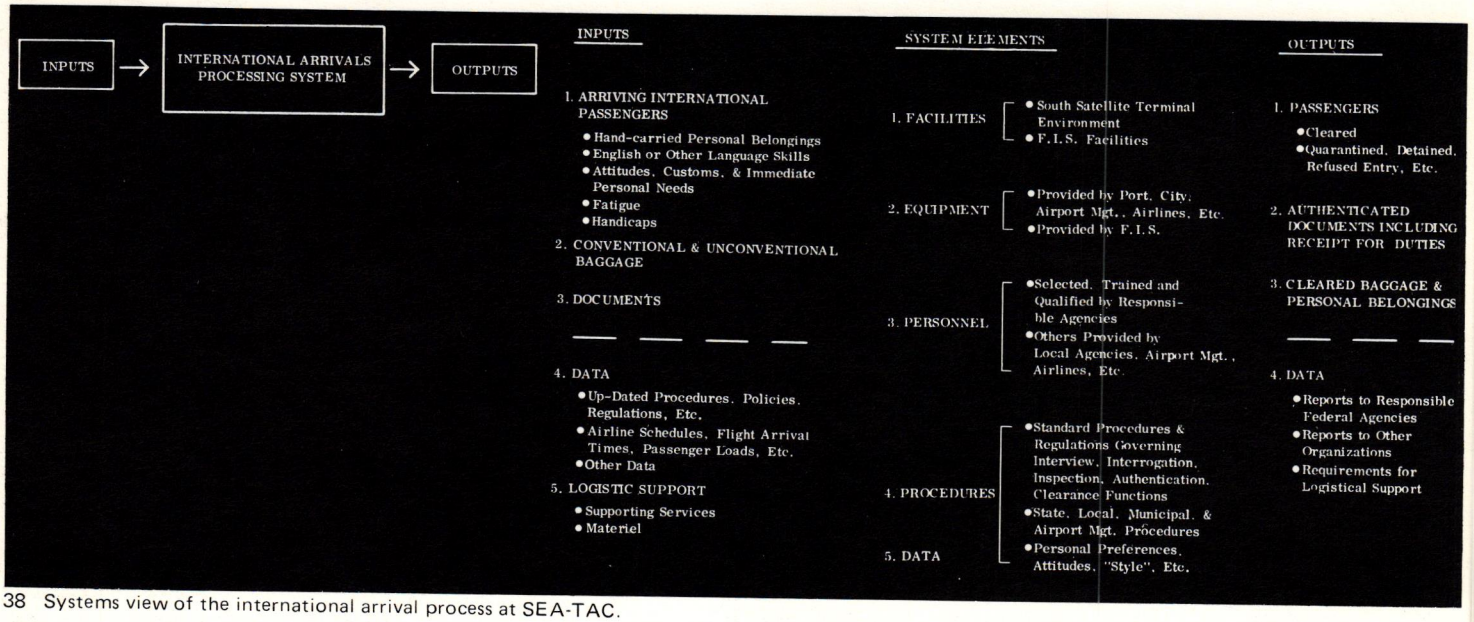
One of the first tasks for T & S was to sort out the real requirements of the Federal inspection system from the day-to-day operating philosophy of the inspectors themselves. Working with a psychiatrist, T & S then isolated four critical problems in the system: queuing, baggage handling, communication, and employee motivation. The final output of the study was not a hardware solution, but rather a report which made the following recommendations:

1. That queuing be reorganized to shorten waiting time.
2. That baggage handling be facilitated by semi-automated carts that are indexed forward on a moving belt while passengers wait, seated, nearby.
3. That the amount of "visual noise" in the terminal be limited. "Improper communication generates anxiety," says Tepper, "but the problem at SEA-TAC was too much, not too little, information. We recommended less signage and more process: a multi-lingual information kit to be distributed to travelers before they arrive so that they will know what papers they need and what they must do; and a welcoming program in which each plane is met by a specially trained employee who then escorts the passengers through the clearance procedure."
4. That employees be positively motivated to make clearance procedures as quick and painless as possible. "Usually," Tepper points out, "all the design effort goes into making the traveler comfortable and no one pays any attention to the inspector. That's why there's all that carpeting and nice furniture in passenger holding areas while inspectors have to stand for eight hours a day on cold concrete. Some employees at SEA-TAC were actually bringing in their own pieces of carpet to stand on! Naturally, employees are aware of the consideration being lavished on passengers; after a while they get bitter and start to make things harder, rather than easier, for passengers."



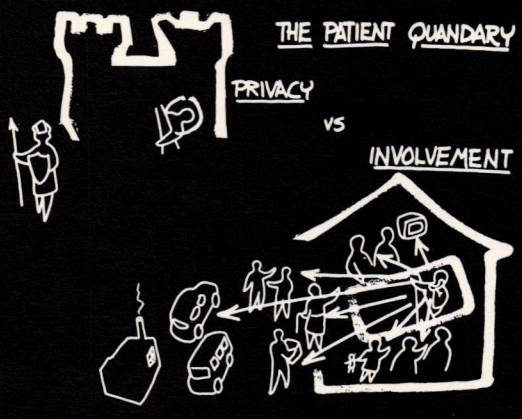
37 Model of the South Satellite showing successive positions of the first passenger as he moves through the inspection service.

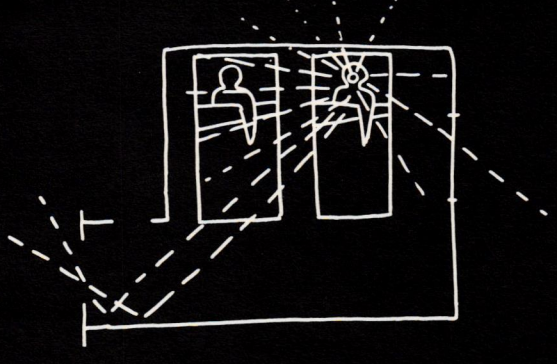
To date, the Seattle Port Commission has only partially implemented these recommendations: queuing has been reorganized, a modification of the baggage handling proposal has been adopted and the information kit is in the works. But even the full report recommendations are regarded by Tepper as "just band-aid solutions." "The international arrival process—which affects more and more people as air travel increases—cannot be handled effectively on a local or even a regional basis. What we're interested in now is a broader study attacking the problem nationwide. Only with a full-scale systems approach can procedures be rationalized and facilities standardized to the point that all international airports in the country would use the same type of hardware (modular and interchangeable), that would make arrival in the United States easier for travelers and would also lead to considerable savings in dollar costs and material resources."

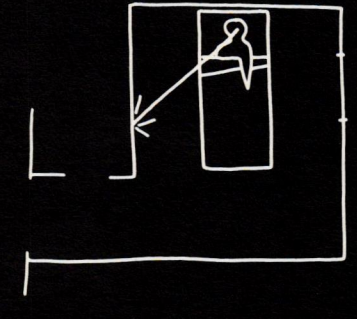


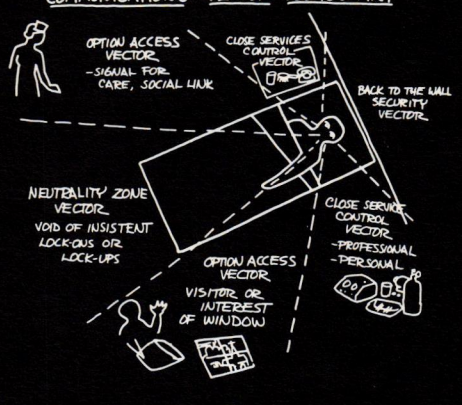
38 Systems view of the international arrival process at SEA-TAC.

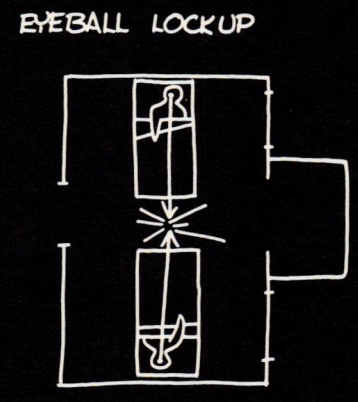
Robert Propst

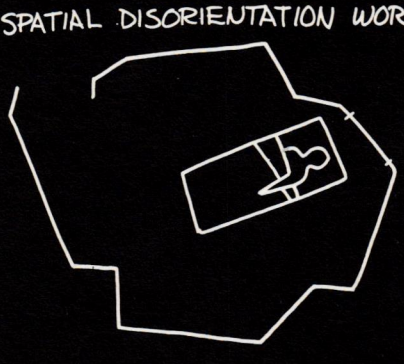


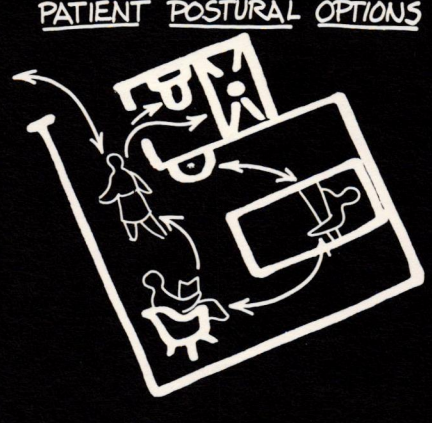


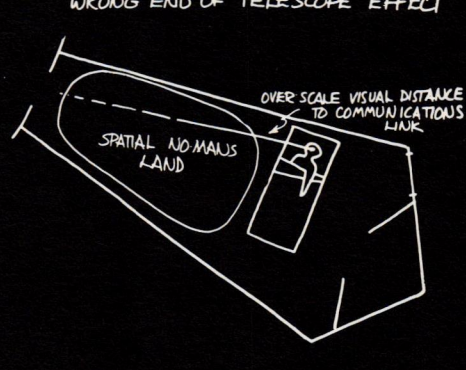












39 Robert Propst's sketches of both psychological and physical patient-environment relationships.

Herman Miller Research Corporation

Robert Propst/Herman Miller Research Corporation

Robert Propst began his career some 25 years ago as a graphic artist, sculptor, inventor (he now has more than 70 patents in the United States and abroad) and educator. In 1953, after having taught at the University of Colorado for five years, he formed the Propst Company, a Denver-based design and development consulting firm retained principally by aircraft, lumber, building systems and institutional equipment companies. In 1960 the Propst Company was merged with Herman Miller, Inc., the well-known furniture manufacturer, and Propst became director of the newly-formed research division. It was in this capacity that he developed the very successful and, at the time, revolutionary Action Office—an integrated system of free-standing open-plan office furnishings styled by George Nelson's office under the direction of Ron Beckman and introduced to the market in 1964. Then in 1968 Herman Miller incorporated its research division as a subsidiary, the Herman Miller Research Corporation (HMRC), with Propst as President. The purpose of this move was to permit the research operation to enter into joint ventures and, as Propst puts it, "more frank relationships" with companies other than Herman Miller.

Since 1968, HMRC has been primarily involved in the development of interior facilities for hospitals, schools and offices. "Mere product work," says Propst, "even at its best (and by and large it is just cosmetic) leaves untouched the incredibly complex and demanding problems of institutional living. The broad outlines of what institutional living is all about are just beginning to emerge, and it is deplorable that designers of the physical environment have such a shallow commitment to the rigors of this new discipline." One of HMRC's objectives is to give people who live in institutions (and that includes almost everyone at some point in his life) "good, new information . . . with which they can make good decisions about how to use their physical environments." To this end, HMRC has been designing what Propst describes as "very low-key, fashion-proof" institutional facilities backed up by "open-ended research:" an on-going process of "rebuilding, re-analyzing, and on-the-spot observation" that does not end when the paint on a prototype dries. As part of this process, HMRC writes into its contracts provisions for post-production evaluation, some of which is funded jointly by Herman Miller and the Corporation's clients.

Decrying the "hit-and-run" nature of conventional facilities planning, Propst is now hoping to set up another subsidiary venture, the Propst Planning Team, to attack the full range of facilities management problems. "The client," says Propst, "cannot expect a 'perfect solution' to be delivered by an outsider (the designer) who then goes off and leaves him to stew in the juices of an already obsolete answer. While he's a client, everybody loves him. But the minute he moves in, all that love and understanding disappear and he's stuck with a facility that is uncomfortable and unworkable; whatever may have been 'planned' just goes to hell." The result is "environmental anarchy," and the only way to avoid it, Propst believes, is through "human performance planning," an approach that stresses productivity rather than visual uniformity; communications strategy rather than mechanical geometry; performance economics rather than first-cost-

only accounting; functional rather than abstract esthetics; and the replacement of rigid institutionalization with healthy social structure. One of the objectives of the Propst Planning Team will be to develop a client's in-house capability to implement this kind of planning on a continuing basis.

Plans for this new venture are a direct outgrowth of the work now going on at HMRC and of Propst's attitudes toward the current state of design generally. The most serious problem in industrial design today, and one of the factors precipitating its decline is, in Propst's opinion, that it plays such a superficial role in problem definition. He values his relationship with Herman Miller in part because it gives him an advantage few consultants enjoy: the opportunity to "seek out problems and cause things to happen," to exert continuing influence on project development from the early stages of problem definition and research through the final production. "I don't want to commit time and energy to a project unless I can deliver to the user," says Propst. "My passion is to get involved with organizations that have a mission, and I'm basically attracted to working with industry and established institutions because if I do a good job, I'll be there tomorrow. That means I can involve the client in change from within. We can't kick industry into being 'good boys.' That's what's wrong with Nader's approach. What industry does respond to are ideas that have some commercial appeal, some economic justification. If the designer can get 'inside' with ideas like that, then he can begin to involve industry in change."

One of the difficulties of bringing about change—even slow change—is what Propst sees as a scarcity of designers genuinely willing and able to work for it. "Many designers today have the facility, but few have the vigor. We are a society that talks incessantly about everybody being 'satisfied' but in reality the life-goal of most people is just to 'stay out of trouble.' Those people truly interested in problem solving have almost reverse appetites: they're attracted to rigor, difficulty, turbulence—to what everybody else wants to avoid—and they're few and far between, even among the younger, more idealistic generation. Unfortunately, industrial design attracts a lot of 'surface' people interested only in cosmetics; to quote Raymond Loewy, most design students are 'toadstools.' Those with real talent—the strong, vital thinkers—are falling over into the social sciences. On more and more projects, particularly at the institutional scale, the important design decisions are being made by anthropologists, sociologists and economists. These people are really today's designers in disguise."

All this notwithstanding, Propst still believes that it is the artist who is best equipped to "beat the unknowns" and that the industrial designer, whose education combines art and technology, has a special obligation to play a strong role in the social process. "Designers can't change people's minds about how they should live; people must change their own minds. And they are changing their minds right now; that's what vandalism and 'disenchantment' are all about. But artists and designers must function as innovators—not just craftsmen—in stimulating and responding to changes."

In order to strengthen its problem defining capabilities members of the HMRC staff frequently attend materials seminars and engineering conferences—places where, as Propst puts it, "you don't usually find designers." Among the most frequently used investigative tools at HMRC is the camera. "People's dialogue with the environment is fanciful," says Propst, " and photography dispels fancy." Working with high-speed film, available light and a technique known as grab shooting ("you must be unobtrusive to get real information"), Propst's researchers document thoroughly with slides and time-lapse motion pictures the environments under study.

Despite the heavy emphasis on institutional facilities (in addition to the projects described here, HMRC has researched and developed interior environments for the Clear Creek Secondary School in Idaho Springs, Colorado, Harlem Prep in New York City, the Rosewood School in Jenison, Michigan, and is now researching dormitory living at the University of Massachusetts), Propst's firm is also involved in work on the home environment. And recently HMRC entered into a joint venture with Southern Pulpwood to develop a timber harvester that saws off a tree and loads it onto a carrier in one continuous motion (thus eliminating the need to clear large sections of forest just to remove fallen timber), then plants a new seedling in its place.

The Co/Struc hospital system (figs. 39-43) and Bendix Experiment on the machine-related office (figs. 44-48) are typical of the firm's institutional facilities work.

Co/Struc Hospital System
Sponsor and manufacturer: Herman Miller, Inc.
Designer: HMRC

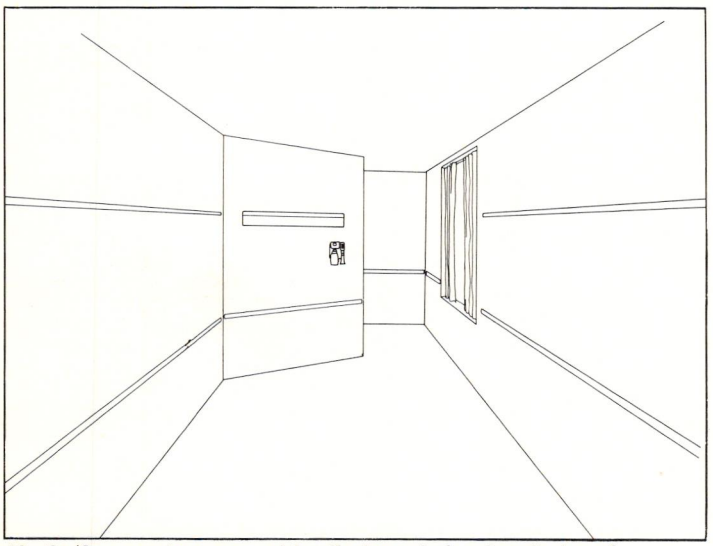
In 1960, what was then the research division of Herman Miller, Inc., began a series of in-depth studies on patient care, materials handling, and supply problems as related to the design and management of hospital interiors. The objective: to develop a systems approach to hospital furnishings that would simplify and integrate discrete but related functions (heretofore designed, if at all, on a piecemeal basis) and make it possible for hospitals to provide improved, responsive patient care at reasonable costs. The procedure: ten years of exhaustive research and development, the first year and a half of which was devoted to problem search and definition uninhibited by preconceived ideas (Herman Miller was, at that time, completely new to the field of health care). During this period, Propst's staff prowled around hospitals documenting everything from traffic patterns (what moves? when? how? where to? randomly? on schedule?) to the size and contents of the suitcases patients bring in with them.

At one point, Propst himself was hospitalized for treatment of a back ailment, an experience that led him to conclude that the conventional hospital is simultaneously a "communications vacuum" and a "forest of legs." Having determined the parameters of the problem, in November 1962 Propst's staff installed a test prototype of the Co/Struc system in a 40-bed unit of the Theda Clark Memorial Hospital in Neenah, Wisconsin. During the next 30 days, patients and personnel were interviewed to determine their reactions

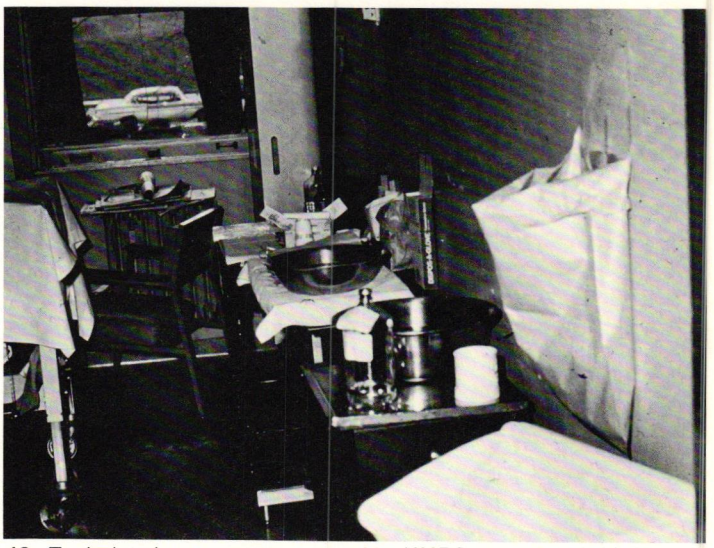
to the experimental set up, routine operations were monitored by cameras and on-the-spot observers, informal comments were recorded, and more formal work-sampling and direct-time studies were conducted.

On the basis of feedback from the Theda Clark experiment, design criteria were stabilized in 1963. Then began the search for materials to meet these criteria. The use of disposable linens was explored with Kimberly Clark. (Provisions for handling both disposable and returnable linens were subsequently built into the Co/Struc system.) All-nylon structural elements were explored with DuPont, then rejected because they were found to be too limber. Self-skinned urethane was explored with Cincinnati Milling and that, too, was rejected. The microscopic grooves on the surface of ground stainless steel caused that material to be rejected because they impede thorough cleaning and sanitization. Then in 1967, the staff began evaluating GE's Noryl thermoplastic resin. In effect, design of the Co/Struc system had anticipated certain developments in plastics technology, but by 1969 HMRC's work with GE paid off and the decision was made to tool up with Noryl and go.

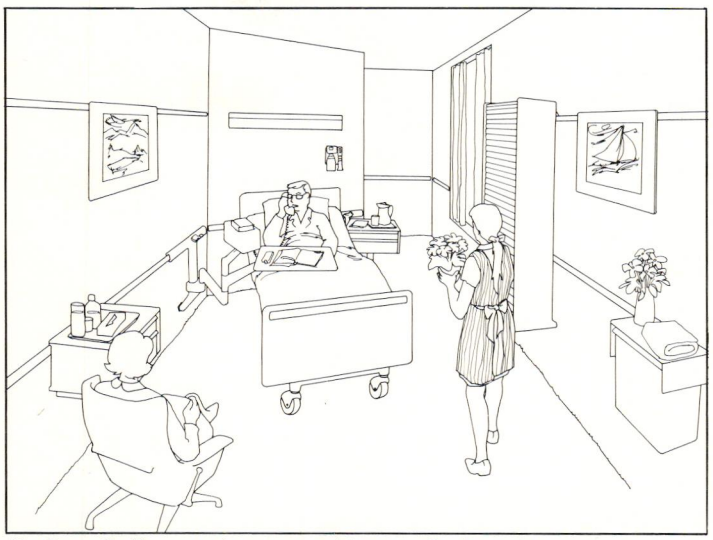
The result: a modular system of coherent structures (Co/Struc) that are lightweight, separable, portable, and stackable (for flexibility, easy maintenance and replacement), completely machine washable and, for the most part, rail-hung (again for flexibility and easy maintenance). The system, which went into the first stages of limited production in 1971 and is now being installed (with the help of Herman Miller consultants) in more than 100 hospitals across the country, is essentially "open-ended." This means that it can evolve with changing needs, accepting new functions as they emerge and discarding old ones as they become obsolete. It is also "forgiving" in the sense that it can accommodate without penalty the inevitable errors and contingencies that arise in institutional management. Because it is neither economically nor operationally feasible for hospitals to revamp their facilities overnight, Co/Struc has been designed so that various elements can be introduced progressively and much of a hospital's old facilities salvaged and upgraded.



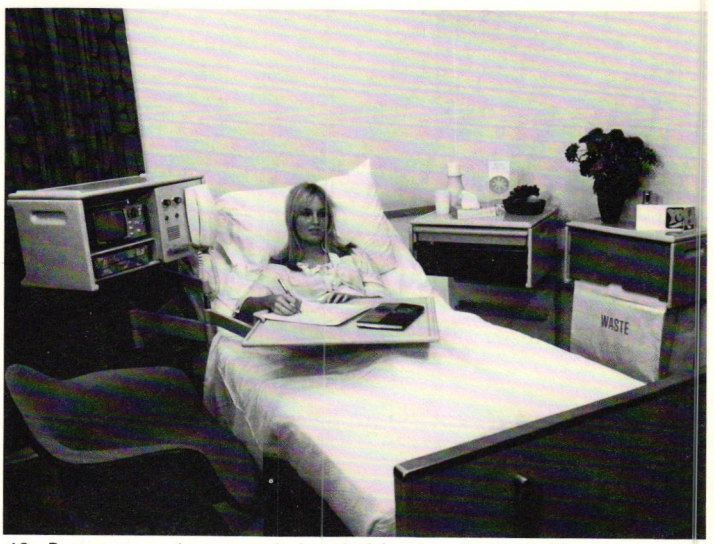
40 Co/Struc patient room with rails shown before installation of furnishings.



42 Typical patient room encountered by HMRC researchers in their investigation of conventionally furnished hospitals.



41 Same Co/Struc patient room with set up for intensive care.



43 Prototype patient room in hospital furnished with Co/Struc system.

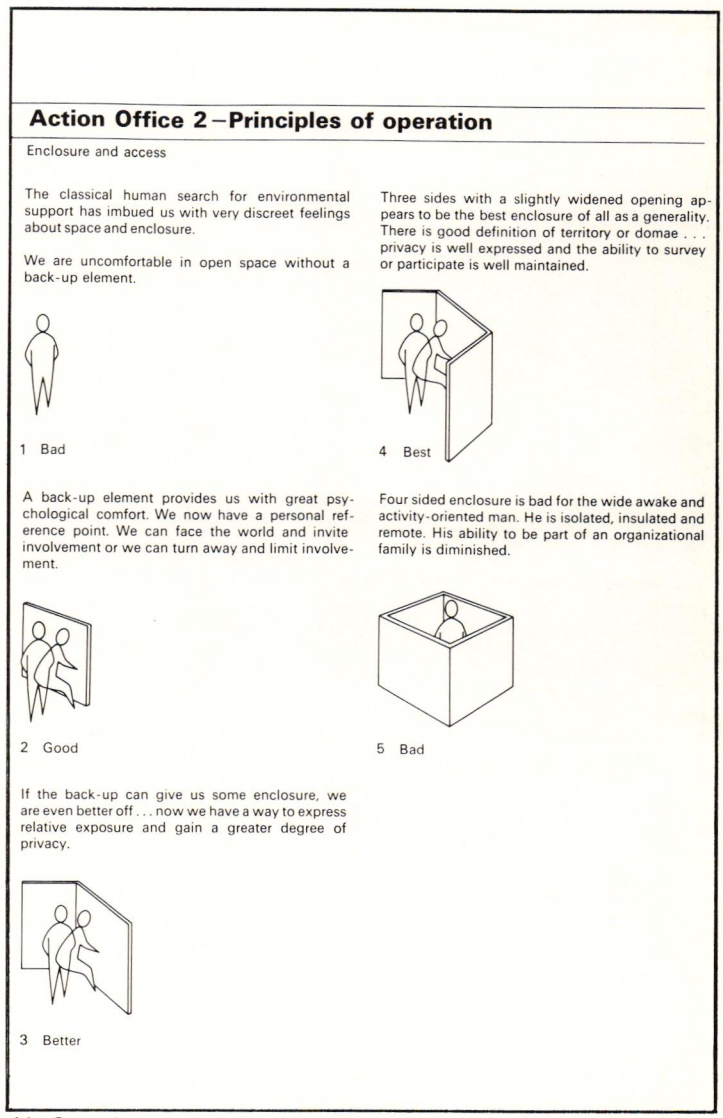
The Bendix Experiment
Sponsor: Herman Miller, Inc.
Subject: The Bendix Corporation Data Processing Center, Ann Arbor, Michigan
Research: HMRC

"Man is a vertically-oriented machine," says Propst, "but conventionally-planned offices stop using space at just about the height it becomes most functional. The result is a sedentary environment that causes serious health problems, a steady deterioration in vitality, energy, and body tone and a waste of very expensive real estate." To solve these problems, HMRC developed Action Office 2, a system of wall and panel-hung office components which enlarges the original Action Office line of free-standing furniture by exploiting the pedestal wall, a concept that permits office space to function in the vertical as well as the horizontal plane. Although the first elements of AO2 went on the market in 1968, the system has continued to grow (the latest addition is a snap-in, snap-out acoustical partitioning panel) and in 1971 a group of electronic data processing (EDP) components was introduced to the line. Development of the EDP components was predicated on the Bendix Experiment, a study of the machine-related office which HMRC completed in 1969 using the Bendix Corporation Data Processing Center in Ann Arbor as its research subject. The objective: to more fully understand the interaction between human performance and work facilities in a computer programing office which, since electronic data processing is now revolutionizing white collar work, Propst believes can serve as a prototype for most future office environments.

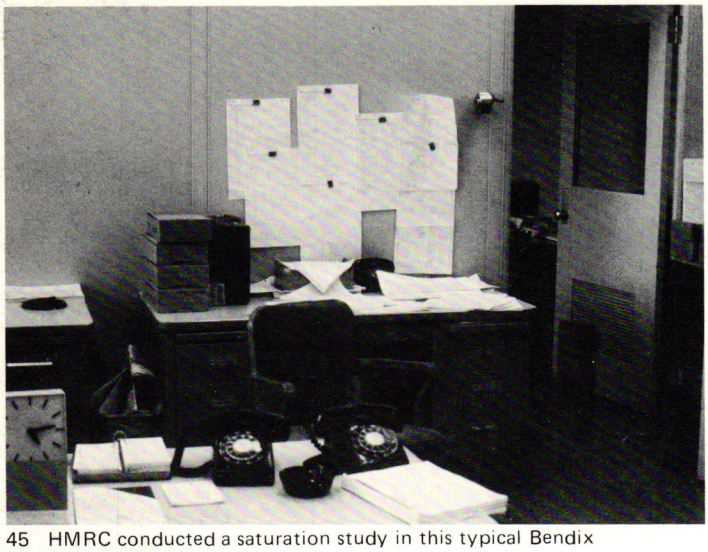
The method: a saturation study of one Bendix programer's office using time-lapse photography and personnel interviews. A small, acoustically housed camera was mounted unobtrusively in a corner of the office to record three days of activity in the programer's existing environment. The programer was then interviewed not to ascertain his opinions but rather to determine what, precisely, he had been doing at various moments recorded on film. Taking into consideration the programer's explanations of his activities, HMRC researchers then screened the time-lapse films on a rear projection unit over which was placed an analysis sheet on which various objects and actions were traced. From the films, analysis sheets, and interviews, the researchers compiled data on facility-related factors (location, size and design of the desk, auxiliary equipment, communications equipment, storage facilities, etc.); body related factors (how people maneuvered and operated in and through the office; conference-related factors (frequency, duration, number of people involved and relative physical position) (figs. 45, 46); material-related factors (access to and distribution of work tools); and work-generation factors (format of work surfaces, array and use of materials, zonal priorities, generation at start of day, desk clearing, and relative distribution of time spent on various activities).

On the basis of this analysis, a modified work environment (figs. 47, 48) was developed by HMRC and substituted for the programer's original facilities. After a shake-down period in which the programer was allowed to adapt to his new environment, a second three-day series of time-lapse photographs was taken, more factual interviews were conducted, and the analytical process repeated.

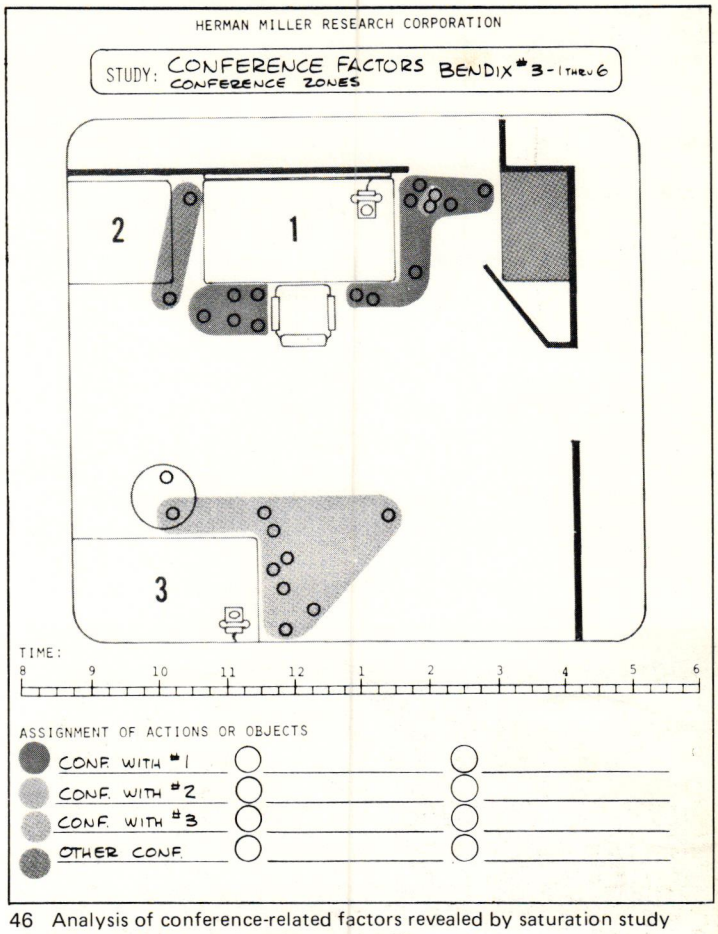
The result: establishment of design criteria for the AO2 EDP components, a group of modular wall and panel-hung units that improve human performance and efficient use of space by providing vertical as well as horizontal work surfaces, better traffic screening, greater storage space, and easier access to work materials and auxiliary equipment—all within a flexible system that permits programers or other machine-related office workers to adjust their environments to their own changing needs.



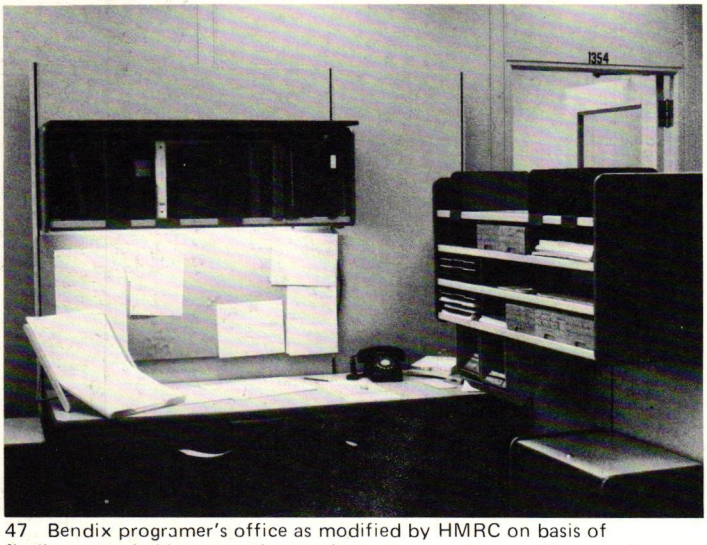
44 Operating principles on which Action Office 2 has been developed.



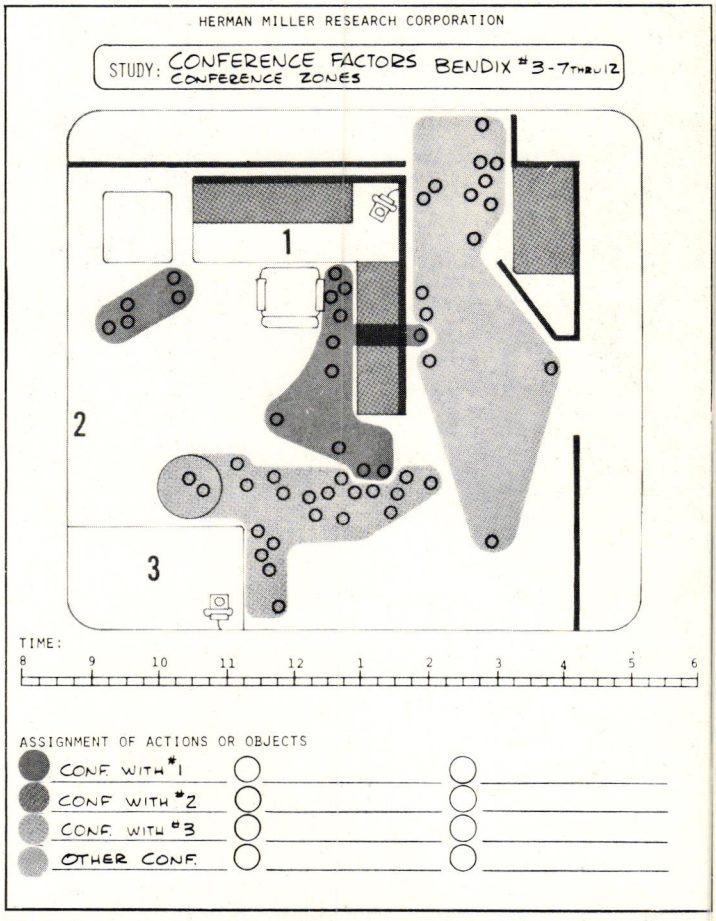
45 HMRC conducted a saturation study in this typical Bendix programer's office.



46 Analysis of conference-related factors revealed by saturation study of existing environment in programer's office.



47 Bendix programer's office as modified by HMRC on basis of findings revealed by saturation study.



48 Analysis of conference-related factors revealed by study of modified environment.